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Future Telco III

Power Play for Telecommunications Companies

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Power Play
for Telecommunications Companies

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Foreword

Dear Readers,

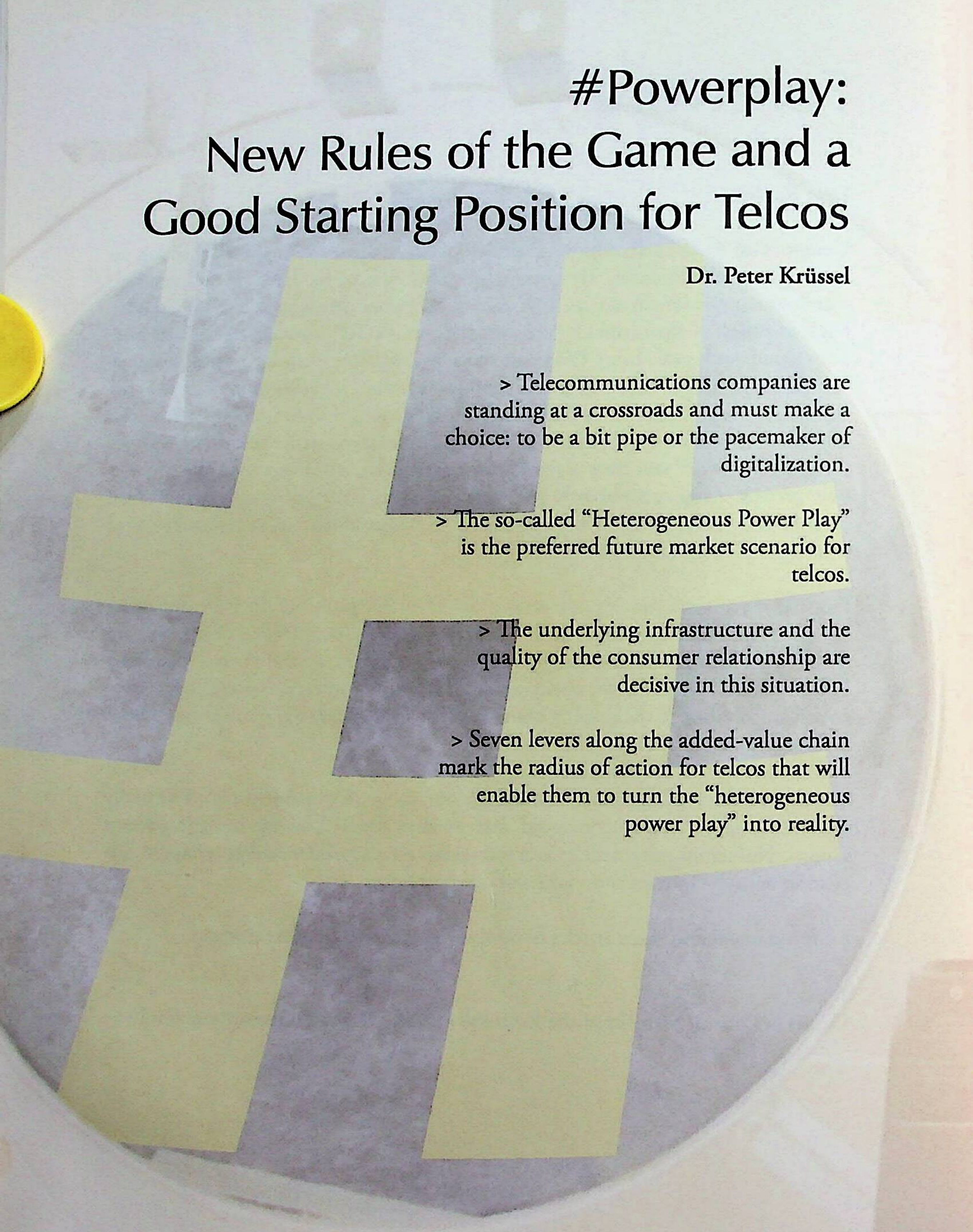
Competition in the telecommunications industry is proving to be as thrilling as any suspenseful whodunit. The pressure for change bearing down on telecommunications companies remains as high as ever. But what first looked like it would be a fast conquest of the market by the over-the-top (OTT) providers has turned into a neck-and-neck race. Large OTTs are already moving in the direction of offering mobile connectivity. Telcos are profiting, however, from the integration of fixed and mobile networks. If these two domains are closely merged in production and in the portfolios of products and services offered to customers as well, the carriers with an integrated network will have a significant competitive advantage over the mobile-only providers and consequently over large OTTs as well. Telcos can moreover set clear lines of differentiation from OTTs by making skillful use of the subjects of security and data protection.

Digitalization is also moving operators into a favorable position. They are becoming the pace-setters for entire sectors of industry – and their capabilities for taking on this role are rising as well. Industry 4.0 and connected car are only two of the many buzzwords that stand for the convergence of telecommunications and other industries. Contributing to the shaping of this future will continue to be a task that is both challenging and appealing.

The Future Telco trilogy is now complete. The range of possible topics is virtually infinite – and yet we are convinced that we have focused on the most important aspects. Numerous guest articles and interviews are also evidence that we are in discussion with the movers and shakers of our economy.

I hope you will find these articles to be absorbing and fascinating reading!

Yours,
Daniel Eckmann, Member of the Executive Board, Detecon International GmbH



#Powerplay: New Rules of the Game and a Good Starting Position for Telcos

Dr. Peter Krüssel

> Telecommunications companies are standing at a crossroads and must make a choice: to be a bit pipe or the pacemaker of digitalization.

> The so-called "Heterogeneous Power Play" is the preferred future market scenario for telcos.

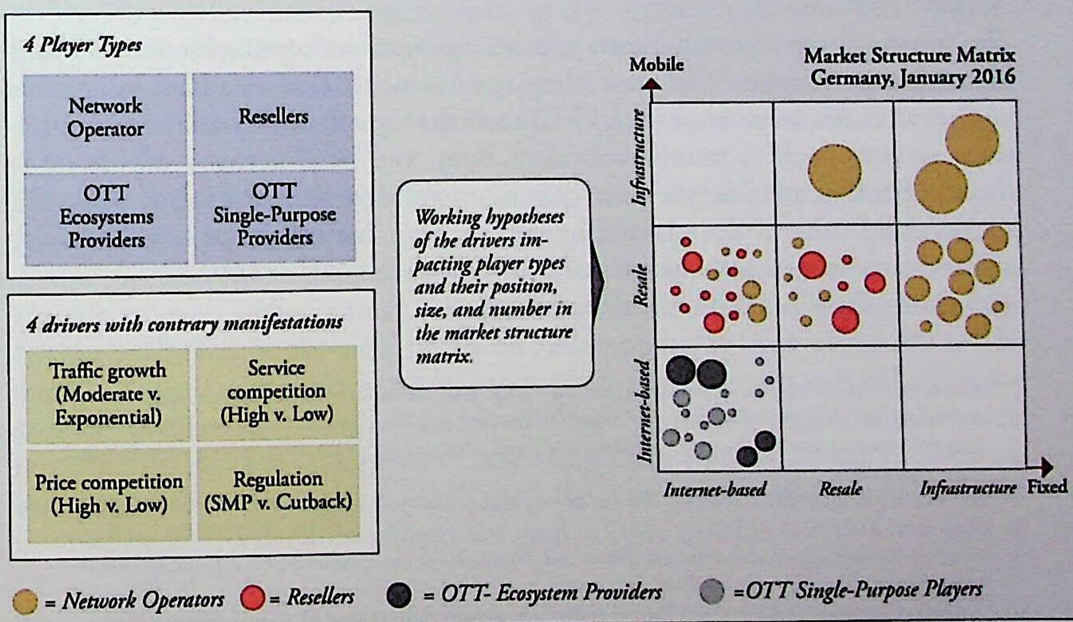
> The underlying infrastructure and the quality of the consumer relationship are decisive in this situation.

> Seven levers along the added-value chain mark the radius of action for telcos that will enable them to turn the "heterogeneous power play" into reality.

Telecommunications companies are standing at a crossroads and must make a choice: to be a bit pipe or a pacemaker of digitalization. This key finding was presented in the second volume of the Future Telco series entitled "Future Telco Reloaded – Strategies for Success Positioning in Competition" and supported by a model for the definition of strategic market scenarios for the telecommunications market.[1]

The statements set forth in this paper regarding the future of the four major ***player groups*** identified here (network operators, resellers independent of network operators, OTT ecosystem operators, OTT single-purpose providers), their options for action according to the manifestations of four ***key drivers*** (traffic growth, price competition, service competition, regulation; two contrary variants for each driver), and the resulting changes in the market structure and possible positions of the player types in the ***market structure matrix*** not only remain valid today, but, as our observations indicate, their relevance and timeliness have increased. In our view, the latest developments on the markets confirm the core statements of the model and the presumed cause-and-effect relationships. Figure 1 illustrates the three key elements of the market scenario model.

Figure 1: Key Elements of the Model for Definition of Market Scenarios


4 Player Types
Network Operator
Resellers
OTT Ecosystems Providers
OTT Single-Purpose Providers
4 drivers with contrary manifestations
Traffic growth (Moderate v. Exponential)
Service competition (High v. Low)
Price competition (High v. Low)
Regulation (SMP v. Cutback)
Working hypotheses of the drivers impacting player types and their position, size, and number in the market structure matrix.
Market Structure Matrix Germany, January 2016
Mobile
Infrastructure
Resale
Internet-based
Internet-based
Resale
Infrastructure
Fixed
● = Network Operators
● = Resellers
● = OTT- Ecosystem Providers
● = OTT Single-Purpose Players

Source: Detecon

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[1] *Cf. Krüssel, Lundborg, Jochum, Obeloer, Market Scenarios, in: Future Telco Reloaded 2015; Detecon Opinion Paper, Strategic Market Scenarios – Methodology and Application on the German Telecommunications Market, 11/2015.*

The traffic growth driver

Traffic growth is, and remains, a key driver of changes in the market structures and results from numerous technical developments,[2] new services,[3] business models,[4] and user habits[5].

This has direct impact on network operators in particular. They must competently handle the growing and more volatile traffic quantities and the demands that will be made on future networks with regard to capacity, (worldwide) coverage, integration and seamless connectivity, quality parameters, robustness, reliability, and affordability. Not all network operators will be able to master these challenges, especially in regions or countries where traffic volume is rising significantly. Only integrated carriers – network operators who possess the two domains of fixed and mobile networks in sufficient granularity – will be able to accomplish this. In these countries, traffic growth will be a major driver of consolidation among network operators. The goal will be to take care of the traffic quantity while maintaining the demanded quantity and observing the constraints of economical operation. Numerous examples of M&A and divestment transactions in Europe are evidence of this.[6]

The service competition driver

The service competition between telecommunications companies and OTTs is increasing in intensity and expanding to encompass further added-value areas and services. In some countries, OTTs are already offering classic communications services such as mobile contracts, lines, and fixed network telephony in their portfolios, putting them in direct competition with the telcos along the entire added-value chain – including connectivity. They are relying in these cases on innovative access technologies of many different types or MVNO agreements with established mobile network operators.

[2] *Examples: artificial intelligence, virtual/augmented reality, 360° videos, new high-resolution displays, new access technologies for fixed and mobile networks, centralization and virtualization/softwareization of products in the networks accompanied simultaneously by distributed intelligence and storage on the peripheries of the networks (edge computing).*

[3] *5G-oriented use cases, M2M, IoT, cloud-based services, mobile video streaming, etc.*

[4] *IaaS, PaaS, SaaS, NaaS.*

[5] *Growing numbers of personal, connected devices and growing use of smartphones as personal switchboards for utilization of all possible services, desire for constant connectivity independent of location.*

[6] *Telefónica's sale of EE to BT in Great Britain in 2015, Vodafone's acquisition of KDG in Germany and Ono in Spain in 2014, Orange's purchase of Jazztel in Spain in 2015, Telekom Austria's purchase of One in Macedonia and of Amis in Slovenia/Croatia in 2015, Numericable's purchase of SFR in France in 2014, Telenet's purchase of Base in Belgium in 2016.*

Alphabet has been offering fixed network telephony, including the related devices, along with Internet access in the so-called Google Fiber cities in the USA since March 2016.[7] Moreover, Google has used the "Google Fi" service in the USA to occupy a position before the customer as an MVNO or mobile network provider, riding on the T-Mobile US and Verizon networks as well as public hotspots to obtain access. Alphabet is also engaged in the initiative "LinkNYC[8]" through Sidewalk Labs (which, in turn, works through the company Intersection); the campaign's goal is to provide free WiFi in New York through 7,500 modern phone booths or Internet kiosks. The first Internet kiosk in futuristic look was unveiled at the beginning of 2016. In addition, Alphabet is working with the Google Loon project and testing the deployment of gas-filled balloons that float in the stratosphere and operate with solar power as a means of providing Internet service to remote regions. Another example of its determination to move toward access infrastructure is the investment made in the company SpaceX at the beginning of 2015 with the future goal of building up a network of near-earth satellites providing Internet access.

Facebook is driving these efforts as well. During the developer conference held in March 2016, the company presented various initiatives related to the provision of access to the Internet. Cooperation with Eutelsat and the company Spacecom includes plans to position satellites in geostationary orbit; once in place, they can be used to provide Internet connectivity to the African continent. The "Aquila" project is investigating the use of giant solar-powered drones as a means of providing Internet connections in rural or remote areas. These drones operate at an altitude of 20 kilometers and can remain in the air for up to 90 days.

The "Terragraph" and "Aries"[9] projects keep their feet on the ground and are studying terrestrial access technologies that are also the subject of intense interest on the part of carriers and could be used in densely populated areas or cities. Terragraph relies on low-cost small cells that broadcast in the 60-GHz band and, as envisioned by Facebook, could be placed on lampposts at intervals of 200 to 250 meters. Aries, on the other hand, depends on improvement in spectral efficiency and energy efficiency by using "massive MIMO" (multiple input, multiple output). In the tests, a mobile network base station was equipped with 96 antennas that can broadcast 24 streams simultaneously in one spectrum. Spectral efficiency of 71 bps/Hz was achieved here; the goal is 100+ bps/Hz.

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[7] *Cf. http://googlefiberblog.blogspot.de/2016/03/fiberphone.html.*

[8] *Cf. https://www.link.nyc/.*

[9] *Cf. https://code.facebook.com/posts/1072680049445290/introducing-facebook-s-new-terrestrial-connectivity-systems-terragraph-and-project-aries/.*

Facebook announced yet another project – the "Telecom Infra Project" (TIP)[10] – at the Mobile World Congress in Barcelona in February 2016. This is a co-operative project between Facebook, network operators, system integrators, and technology companies that is expected to prepare and share best practices for the planning, construction, and operation of future-proof and efficient telecommunications networks analogously to the model of the "Open Compute Project[11]". Current members include (among others) Facebook and carriers such as Deutsche Telekom, SK Telecom, and EE as well as Intel and Nokia. One of the major objectives will certainly be to lower the costs for telecommunications network components in the areas access, backhaul, core, and management and to put pressure on established network outfitters. The latter could in turn help telcos in the future to construct and operate networks more efficiently, which would subsequently be of benefit to customers in the form of lower prices. At the end of the benefit chain, Facebook would possibly record increased use of its own services by consumers. The possibility that Facebook may be participating in these various connectivity initiatives as a step toward the construction and operation of its own networks remains in the realm of speculation. The activities of the Facebook-led projects "internet.org" and "Free Basics"[12] and their claim "Connecting the World" indicate that this step will probably become reality in the remote regions of the world where the two-thirds of the world's population without Internet access live. The heatedly disputed engagement of internet.org in India, although it ultimately came to naught because of network neutrality issues, is evidence of this.[13] The objectives in regions that already have a good infrastructure in place are probably more related to the goals mentioned above (TIP): to reduce costs and prices for network operators or consumers as well as to drive the use of services, which would also benefit Facebook.

Another future pathway of the OTTs for mapping connectivity in mobile networks before the customer comes from the so-called eSIM (embedded SIM); this is a freely programmable SIM card or chip that has been permanently installed or integrated in the end device. These eSIM cards can be programmed "over the air" via the cellphone, smartphone, or tablet with profiles and rate plans of various providers. The eSIM has an essential role to play for all M2M-based applications, for the Internet of Things, and for connected devices such as sensors or vehicles. Their broad utilization in tablets or smartphones is still in the future, but various sources expect this to happen in 2017. Vodafone, in cooperation with Samsung, launched a smartwatch as an eSIM device in Germany in March 2016.

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[10] *Cf. http://newsroom.fb.com/news/2016/02/introducing-the-telecom-infra-project/; cf. as well https://telecominfraproject.com/.*

[11] *Cf. http://www.opencompute.org/.*

[12] *Cf. https://info.internet.org/en/.*

[13] *Cf. https://www.facebook.com/zuck/posts/10102033678947881; cf. also the article by Peter Krüssel, Telecommunications at the Crossroads Between Bit Pipe and Pacemaker of Digitalization, Future Telco Reloaded, p. 15 pp.*

The mobile companies have an ambivalent relationship to this innovation. On the one hand, there are advantages to it. They include leaner logistic processes because it is no longer necessary to send the conventional SIM card to the users. Moreover, new products and services that enable consumers to register all imaginable Internet-capable devices, connect them in a network with one another, and transfer phone numbers, then use them on a number of devices and manage them from a single device such as the smartphone can be created. On the other hand, there are disadvantages, primarily a result of the possible loosening of the customer relationship bonds. As of today, the SIM card represents an important control point for telecommunications companies in their customer relationships. In the future, it may be possible for various contract profiles and rate plans from various mobile providers to be installed on the eSIM, and customers can choose from among them as needed. However, we must wait and see what degree of freedom for changing providers and rate plans, what binding terms after a change or what frequency of changes in rate plans and/or providers, and what authorization for these kinds of changes will be granted to consumers and who will determine these conditions (customer, device manufacturer, mobile company). At its core, the telecommunications companies will experience the eSIM as a loosening of the contract relationships previously binding telco and consumer and as additional competition at the customer interface, especially from end device-focused OTT providers such as Apple or Samsung. The latter will be able to pre-program profiles from cooperating network operators on eSIM cards installed in their devices and market a bundled package provided on the eSIM comprising device, platforms and services, and connectivity. Packaged offers with highly attractive prices could be put together for customers from the wealth of offerings that can be combined with one another within the framework of the practiced data-centric business model.

Another alternative for OTTs to provide connectivity in the future will come from the network slicing[14] method that has become the subject of intense discussion because of the technological innovations (SDN, NFV, SDR, 5G) and the extremely diversified 5G use cases. Network slices are discrete logical networks that can be provided by network operators for specific customers and their needs and business models and that are based on a common physical infrastructure (Network as a Service). Multiple virtual E2E networks can be operated on one common platform. These dedicated networks can be made available, for example, to large business customers according to their highly specific demands. Energy or automotive companies (as well as others) could be interested in operating these logical networks on their own in accordance with their various use cases featuring differing quality requirements and functions. This type of option could of course be of value to the OTT players.

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[14] *Cf. http://www.ericsson.com/res/docs/whitepapers/what-is-a-5g-system.pdf.*

In any case, it must be noted that in the future the OTTs will be able to cover the level of connectivity before the customer, at least in mobile services, in addition to the service level where they are already successful. This will be achieved either by the construction of their own infrastructure or (the more likely occurrence) through cooperative ventures with carriers in the form of MVNO or resale agreements and network slicing options or via the eSIM. Telecommunications companies will be left with the fixed networks and integrated connectivity products as an important differentiation element. The OTTs are, however, already planting their flags in the "home zone", traditionally addressed via the fixed network, by positioning innovative end devices such as home servers, home assistants, smart home components, or WiFi routers here: Amazon Echo, Google Nest or Google Hub or Google Home.

The price competition driver

The outlook shows that the third key driver of changes in the market structures and market scenarios, the price competition, will not go untouched. The entry of the OTTs into connectivity business will put downward pressure on the prices for Internet access and mobile rate plans of the carriers, particularly since OTTs have the opportunity to operate on a growth market new for them while using the appropriate bundles and lateral subsidies from their previous core business. Rob Nail, the co-founder of Singularity University in the USA, assumes that these activities will lead to free Internet access in ten years or less.[15]

But even without this more long-term impact of new competitors, the prices in Germany remain under pressure because of the stiff competition among established providers. The Federal Statistical Office has determined that the price index for telecommunications services continued its decline in 2015, posting -1.3% to -0.7% for fixed network and Internet and -2.0% for mobile services.[16] This is a steady trend that has not displayed a single outlier in the past ten years.

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[15] *Cf. http://singularityhub.com/, cf. as well http://www.welt.de/wirtschaft/webwelt/article152198869/In-29-Jahren-sind-die-Probleme-der-Menschheit-geloest.html.*

[16] *Cf. https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/Preise/Verbraucherpreisindizes/Tabellen_/Telekommunikationspreise.html?cms_gtp=146542_slot%253D2%2526146546_list%253D2&https=1.*

Indicators of a continued decline in prices are the exploitation of allotment models by Vodafone and Telefónica, who want to refinance their upfront payments as quickly as possible, as well as the competition for bandwidths between KNB and TNB.

In the mobile sector, data volumes and transmission speeds as part of the bundled packages are constantly becoming larger and faster. Moreover, LTE technology has been opened up for the wholesale market, making a long-term price premium for LTE more unlikely. On the German market, Rewheel's Digital Fuel Monitor Comprehensive Report from 4 January 2016 determined a very high price for 4G-based data packages among the 28 EU countries and attributed this to the rigid oligopoly-like structures on the market.[17] There is obviously a need to catch up in the European comparison. The ongoing price competition is also a consequence of the splitting of the market among three or even two providers. The weighting of the three rough segments defined essentially according to willingness to pay – premium shopper, smart shopper, and discount shopper – is shifting toward the discount shopper. The premium segment appears to be largely stable for the moment, but the segment of the smart shoppers is shrinking. There is a host of low-cost brands or second brands of carriers, particularly in the growing discount segment, that seek to make use of very sharp, often temporary offers of services and products structured similarly to campaigns to lure highly specific, price-sensitive customer groups. The most recent examples are the activities of the Drillisch brands simply and WinSIM in Germany, which have galvanized the competition with campaigns of aggressive pricing. Drillisch especially, thanks to its MVNO status on the Telefónica network, has enormous entrepreneurial freedom with respect to the terms and conditions of its products. The price gap between these products and those of the established network operators is in some cases enormous. This will undoubtedly exert a gradual downward pull on the premium segment as well.

The regulation driver

The regulation driver is significant for the market scenarios because the regulatory framework affects the power relationships among the players by steering competition, access, price, privacy, and consumer protection. Historically speaking, there are two regulation models worldwide that contrast with each other. While the European regulations follow an asymmetrical approach[18] focusing on the opening of networks, including regulation of access and charges, supplemented by transparency and non-discrimination obligations, the regulation in the USA tends to be more service-oriented.

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[17] *Cf. http://dfmonitor.eu/; cf. also https://ec.europa.eu/digital-single-market/en/news/mobile-broadband-prices-february-2015; cf. also https://ec.europa.eu/digital-single-market/en/news/study-retail-broadband-access-prices-february-2015.*

With its adoption of the "Protection and Promoting the Open Internet Rule" of 13 April 2015[19], the American regulatory authority, the FCC, set new standards for the regulation of broadband and Internet services. The FCC has now put these principles into effect:

> "Blocking" of lawful content, applications, services, and devices that do not represent a threat to the network ("non-harmful devices") is prohibited;

> "No throttling": Network operators are forbidden to slow down specific services or applications on the network;

> "No paid prioritization": Network operators are forbidden to demand payment for preferred provision of any services and applications.

In the USA, this regime of network neutrality functions largely without any regulation of charges and access obligations. Described in simplified form, the aim in the USA tends more to the regulation of the conduct of the network operators – similar to the regulation of competition – while in Europe (in the past) the networks and their opening have been regulated for specific sectors.

The EU, however, has launched a change of course with its network neutrality initiative and supplemented the "traditional" sector-specific regulation with the Network Neutrality Regulation. This obligates Internet providers to make an "open Internet" available to every Internet user by prohibiting any discrimination in the form of paid prioritization, throttling and blocked content (with the exception of unlawful content). Along with this "open Internet", however, providers may offer higher-quality special services "on top", provided that this does not have any adverse impact on the "open Internet[20]".

All in all, the new Network Neutrality Regulation represents further regulation of the telecommunications providers with consequences for market events and the relationship between network operators and OTTs:

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[18] *In contrast to symmetrical regulation, which applies equally to all market players, only certain providers (as a rule, the so-called incumbents, formerly government-owned monopolies) are bound by regulatory constraints in a system of asymmetrical regulation.*

[19] *Cf. Federal Register, "Protecting and Promoting the Open Internet", 13 April 2015; URL: https://www.federalregister.gov/articles/2015/04/13/2015-07841/protecting-and-promoting-the-open-internet.*

[20] *Cf Lundborg, Regulation of Telecom Markets, p. 164 et seqq. in this book.*

> The negotiating position of telecommunications providers with respect to OTTs has worsened because consumers are now in a position to obtain all of the applications and services of the OTTs from any and every Internet connection.

> The limitations on the opportunities to prioritize traffic or to mold the "open Internet" in any way desired mean that telecommunications providers must first invest in the "open Internet" before special services can be implemented. This will not only increase the required investments, but also limits the market potential of services and applications with prioritized traffic because they will always be offered in competition with the "open Internet".

In the market scenario model, this multi-layered regulatory subject is illustrated in simplified form by two opposing variants:

> Variant 1 describes a regulatory cutback for telecommunications companies, including a reduction in the regulatory measures for access and charges, and a weakening of the strict network neutrality requirements. At the same time, the OTTs are subjected to more extensive regulation, above all by regulation of competition.

> In Variant 2, the sector-specific regulation of the telecommunications market ("SMP [significant market power] regulation" with a focus on access regulation at the network level) is retained and strict network neutrality for the network operators is introduced.

These two directions stand for the most prominent manifestations of the regulation driver. In the event of a cutback in regulations for telcos and of regulatory control of the OTTs, the business opportunities for the OTTs could be fundamentally restricted and telco business models (differentiated, for instance, on the basis of QoS) could be realized more freely.

It is not possible at this time to foresee which of the two variants will become reality for the regulation driver in Germany and EU countries because the EU is still working on the general orientation of the regulation within the framework of the "Single Market" initiative and national regulatory authorities still lack practical experience with the Network Neutrality Regulation.

The following variants are assumed for the German market for the other three drivers: traffic growth will be very high, even exponential, rather than moderate; service competition will be stiff instead of weak; price competition will be keen instead of weak. The various players will therefore be active on a market that is characterized by very strong traffic growth, intense price and service competition, and a regulatory situation that is still open.

Options for action by the player types

The specific combination of the driver variants for the German market will affect the options for action of the four player types. These options for action are summarized briefly in the table below.[21]

Table 1: Overview of the Options for Action of the Player Types

Player Type	Options for Action
Network Operators	1. **Consolidation:** The large network operators appear as integrated full-service providers on the market and attempt to display greater presence on the service side before the customer in addition to the infrastructure business. They attempt to take back the ground lost to the OTT ecosystem providers and to cement their relationship to consumers.
	2. **Focus:** The network operators focus on efficient network operation and appear as bit pipe providers or wholesale-only providers without any contact to consumers.
Resellers	1. **Exit:** This player type loses the foundation of its business and disappears from the market as OTT ecosystem provider activities expand into its business model (bundling of connectivity, mobile contracts, devices for a complete ecosystem) or through the carriers within the scope of the expansion of multi-brand strategy or the consolidation by one of the groups.
OTT Ecosystem Providers	1. **Integration:** The ecosystem providers delve more deeply into the added-value chain, enter the business field on the infrastructure side, initially concentrating on mobile service (MVNO, hotspots, eSIM, network slicing, own infrastructure), and continue to force competition on the side of services, content, ecosystems through bundled products.
	2. **Focus:** The OTT ecosystem providers focus on the previously established OTT products on the German market and expand them further.
OTT Single-Purpose Providers	1. **Focus:** The OTT single-purpose providers remain with their current highly specific focus; the dynamics of the Internet economy continually produce new innovations, business models, and players.
	2. **Exit:** The player type disappears from the market over the course of consolidations or cooperation efforts of the OTT ecosystem providers or carriers.

Source: Detecon

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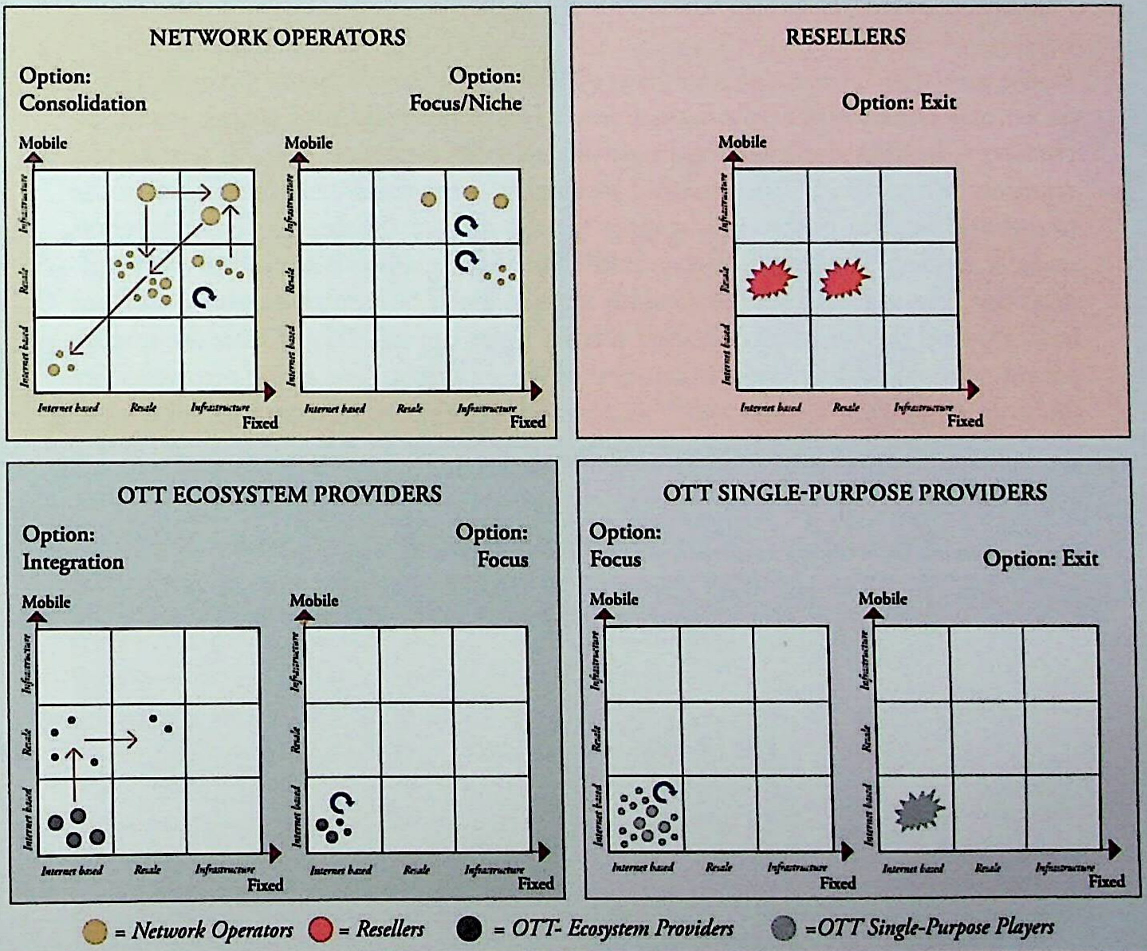
[21] *For a detailed description of the relationships among the effects and assumptions of the model as well as the reasons for the options for action of the players against the backdrop of the individual driver variants on the German market, see Krüssel, Lundborg, Jochum, Obeloer: Detecon Opinion Paper, Strategic Market Scenarios – Methodology and Application to the German Telecommunications Market, 11/2015.*

Figure 2 illustrates the options for action of the individual player types resulting from the driver combination assumed for the German market on the basis of the market structure matrix presented at the beginning.

Market scenarios

A combination of all options for action of the player types results in eight fundamentally possible scenarios. Of these eight, however, the scenarios in which both network operators and OTT ecosystem providers fall back on the alternative "Focus" are unlikely or mutually exclusive because this would create a gap on the market.

Figure 2: Options of the Player Types in Germany


NETWORK OPERATORS
Option: Consolidation
Option: Focus/Niche
RESELLERS
Option: Exit
OTT ECOSYSTEM PROVIDERS
Option: Integration
Option: Focus
OTT SINGLE-PURPOSE PROVIDERS
Option: Focus
Option: Exit
Mobile
Infrastructure
Resale
Internet based
Fixed
● = Network Operators
● = Resellers
● = OTT- Ecosystem Providers
● =OTT Single-Purpose Players

Source: Detecon

The remaining six market scenarios that are meaningful on principle are shown in the chart below.

Of these six scenarios, Scenario 1 (“Heterogeneous Power Play”) and Scenario 4 (“OTT Big Player Dominance”) are diametrically opposed and describe the full range of possibilities. In our opinion, each of them is characterized by high probability.

The scenario “OTT Big Player Dominance”, just like the “OTT Diversity Play”, describes a market on which the telecommunications companies have relinquished their consumer relationship to the large OTT ecosystem providers and ultimately operate as wholesale-only providers or bit pipes for the OTTs.

Market scenario “Heterogeneous Power Play”

In the scenario “Heterogeneous Power Play”, the telcos do battle with the OTTs to acquire consumers at the service level. It will be based on existing assets, including – besides the integrated network with its attributes such as worldwide, seamless connectivity differentiated by quality – the trust customers have in the brand and in data protection, respect for the private sphere, the local presence, and the service. The special sustainable value of these assets is a product of the numerous, differing, and (in part) highly sophisticated 5G use cases, above all from industry and the business customer sector. These use cases emphasize the quality parameters, reliability, and the security of the network. Best effort principles are not enough here; a “serious web[22]” is demanded. Telecommunications companies

Table 2: Combination of Options for Action per Player Type and Market Scenario

		Network Operator Consolidation	Network Operator Focus
		Reseller Exit	
OTT Ecosystem Provider Integration	*OTT SPP Focus*	① „Heterogeneous Powerplay“	② „OTT Diversity Play“
	OTT SPP Exit	③ „Big Player Clash“	④ „OTT Big Player Dominanz“
OTT-Ecosystem Provider Focus	*OTT SPP Focus*	⑤ „Co-Existence“	
	OTT SPP Exit	⑥ „Telco Play“	

Source: Detecon

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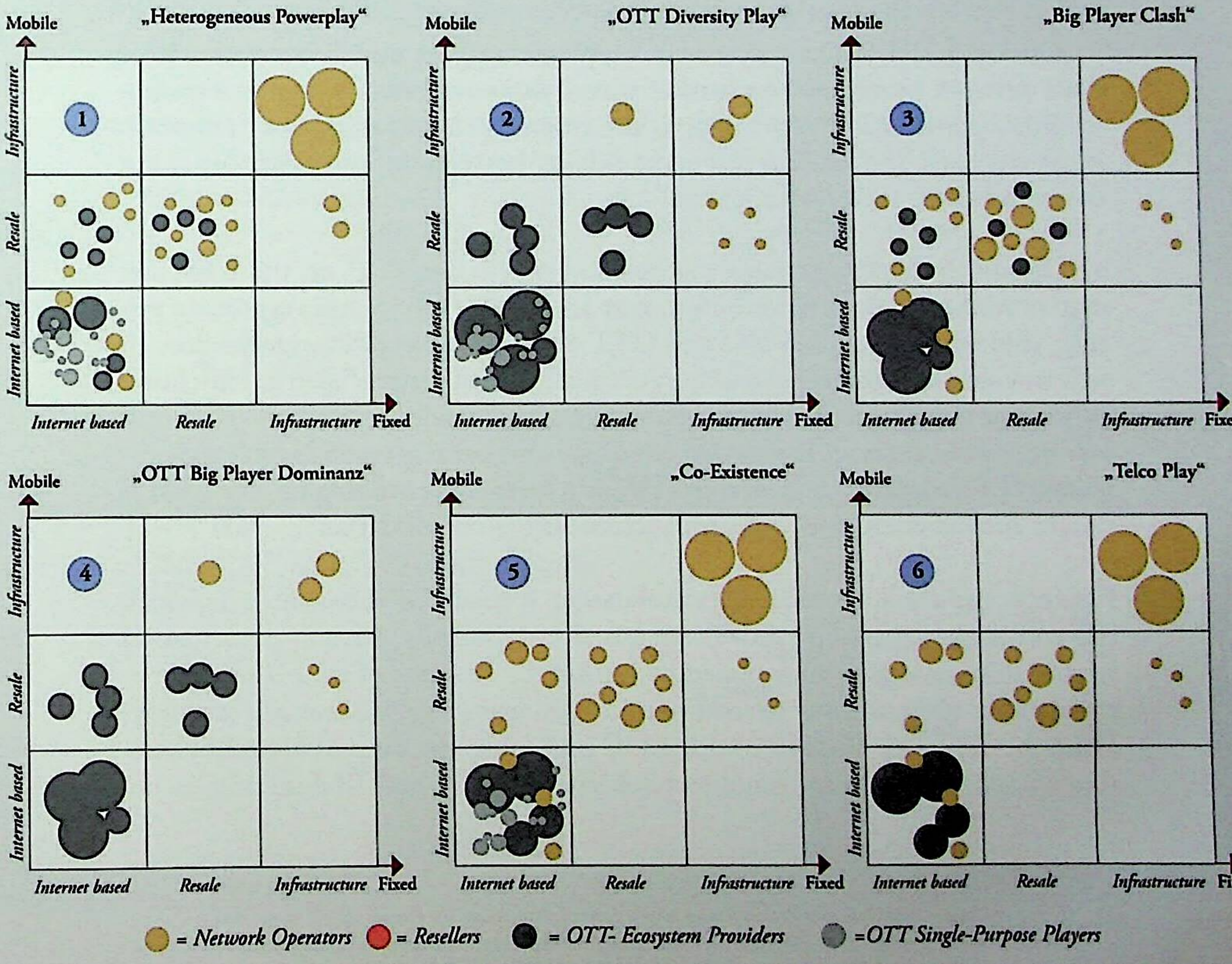
[22] *Cf. Interview „A Question of Trust“, p. 122 et seqq. in this book.*

continue to play a role before the consumer in this scenario. They offer additional services alongside integrated connectivity, they maintain or even extend the consumer relationship, and they occupy niches and micro-segments on the market by pursuing multi-brand strategies. In this way, they will hasten the disappearance of the player type of the reseller independent of network operators from the market in the long run. The OTTs will in turn make use of the various opportunities described briefly above to complete their ecosystem by adding the key component of connectivity and then to compete with the telcos along the full length of the added-value chain. Focus will initially be on the mobile side; the fixed network and products integrated with it will stay with the telecommu-

Figure 3: Market Scenarios and Market Structure Matrices


Mobile
„Heterogeneous Powerplay"
1
„OTT Diversity Play"
2
„Big Player Clash"
3
„OTT Big Player Dominanz"
4
„Co-Existence"
5
„Telco Play"
6
Infrastructure
Resale
Internet based
Internet based
Resale
Infrastructure
Fixed
= Network Operators
= Resellers
= OTT- Ecosystem Providers
=OTT Single-Purpose Players

Source: Detecon

nications companies as a differentiation factor which must be exploited within the window of opportunity that remains. Just like the telcos, the OTT ecosystem providers will have a part to play in taking away the basis for the business of the classic resellers independent of network operators over the long term.

In the case of the “Heterogeneous Power Play”, the result may be a mixed form, depending on the initial situation of the individual telco players. In the future, mobile-only carriers will presumably have a difficult time of maintaining economic sustainability and making use of a convincing portfolio of broad scope before the consumer to survive on the market in their competition with integrated telecommunications companies.[23] They could be tempted to change or extend their business model and to pave the way for the OTTs to mobile connectivity. In Germany this possibility is especially conceivable for Telefónica. We see two options for this player.

> Option 1: Telefónica succeeds in supplementing its mobile network with a fixed network by means of a further consolidation on the German market (in-country consolidation) – whether as the enterprise leader or a junior partner is irrelevant here. The list of possible candidates, however, is not terribly long, and they surely have their own agendas.

> Option 2: Telefónica gains the position of a “cheapjack” on the consumer market with a focus on private customers and mobile service, uses aggressive pricing, multiple brands, MVNO and OTT enabling to heighten competition, or sells its German activities to another international telco player such as Hutchison Whampoa that operates the business with perhaps similar ambitions – connectivity-only provider with low-priced conditions for consumers and wholesale provider/OTT enablers – and that has recently been concentrating on the acquisition of mobile companies in Europe (cross-border consolidation).

Figure 4 depicts a speculative consolidation scenario of this nature in which the consolidation groups shown are based on currently existing participation relationships as well as an assumed fit and similar interests of the players. Essentially, either three or four telecommunications groupings will remain standing: Deutsche Telekom, Vodafone with KDG and Unity Media and a group centering on 1&1 (the direct and indirect holdings of 1&1), and Telefónica or, in the second variant, Telefónica together with an international player such as Hutchison Whampoa, 1&1 with the current holdings, Vodafone with KDG and Unity Media, and Deutsche Telekom.

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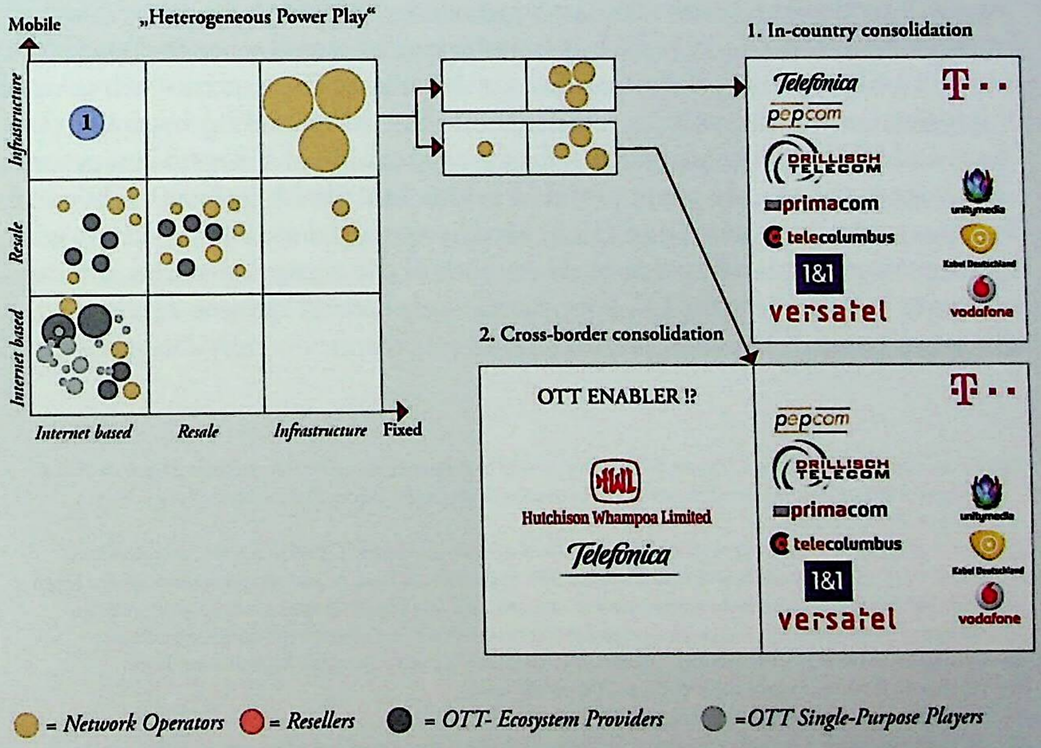
[23] *Cf. Future Telco – Profitability in Telecommunications: Seven Levers Secure the Future, 2014, in particular Krüssel, Network is King!; p. 8; Petry, Future Broadband Communications Between Wishful Thinking and Reality, p. 80; Heuermann, New Network Strategies Preserve the Profitability of the Telecommunications Business, p. 102.*

Integrated telecommunications companies must give thought to how they would like to deal with a competitor of this type in the long run, one who in the future may be dependent on cooperation with them or the OTTs for survival on the market.

Seven levers for the Heterogeneous Power Play

Of the six market scenarios described above, the Heterogeneous Power Play is the most attractive scenario for telecommunications companies. If telcos want it to become reality, they must work on a number of different positions or make use of the seven levers that have been a common theme throughout the first Future

Figure 4: Concrete Variants of the Scenario "Heterogeneous Power Play" for the German Market


Mobile
„Heterogeneous Power Play"
Infrastructure
Resale
Internet based
1
Internet based
Resale
Infrastructure
Fixed
1. In-country consolidation
Telefónica
pepcom
DRILLISCH TELECOM
primacom
telecolumbus
1&1
versatel
T · ·
unitymedia
Kabel Deutschland
vodafone
2. Cross-border consolidation
OTT ENABLER !?
HWL
Hutchison Whampoa Limited
Telefónica
T · ·
pepcom
DRILLISCH TELECOM
primacom
telecolumbus
1&1
versatel
unitymedia
Kabel Deutschland
vodafone
● = Network Operators
● = Resellers
● = OTT- Ecosystem Providers
● =OTT Single-Purpose Players

Source: Detecon

Telco volume of 2014, the following volume in 2015, and the articles published in this book.[24]

The very first position that should be mentioned is the network domain. Just as before, this is the key asset and the core competency of the network operators. In view of coming requirements, the players are called upon to raise their performance capability drastically and, at the same time, to realize enormous progress in productivity and efficiency.[25] New technologies will help to accomplish this. Rigorous use must be made of them to optimize the existing infrastructures[26] and to adapt the corresponding in-house organizational and procedural frameworks quickly.[27]

Equally important are the protection and expansion of the telcos' relationship to consumers. These activities include the creation of a convincing customer experience, the generation of convincing products and services, and the delivery of credible brand promises on the basis of the network operators' strengths.[28] The usable assets include the topics of security, data protection and integrity,[29] local presence over a broad area, service, quality, and integrated networks. The latter aspect in particular is more than just an advantage in production with respect to mobile-only carriers and OTTs. It is an indispensable aspect when the issue is the use of a USP to achieve differentiation on the market. The technical advantages in production can and must be translated into the corresponding integrated products and USPs. Precipitation point for the exploitation of this solid competitive advantage is the specific target group of private households because mobile and fixed networks are required and can be used here in equal measure. Products with intermeshing functionality that build on both of the network domains and cannot easily be copied by the OTTs or mobile-only carriers must be developed for this target group.[30] The latter players tend to concentrate on individual customers on the basis of their exclusively mobile infrastructure. The integrated network and its inherent possibilities for satisfying the demands from the market are even more convincing for business customers.[31]

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[24] *Cf. here and below Volume 1, Future Telco – Profitability in Telecommunications: Seven Levers Secure the Future, Cologne 2014, cf. also Volume 2 Future Telco Reloaded – Strategies for Success Positioning in Competition, Cologne 2015, Detecon.*

[25] *Before others do so ... network outfitters, IT players and software developers, OSS/BSS vendors, etc., as solution providers; cf. in this respect the article by Eberhard, Heuermann in this book, cf. also http://disruptivewireless.blogspot.de/2016/05/telecoms-is-too-important-to-leave-to.html?m=1; cf. also http://e.huawei.com/uk/products/wireless/elte-access; cf. also https://www.benton.org/headlines/att-nokia-utility-iot-offering-rely-dedicated-spectrum .*

[26] *Cf. chapter Network, p. 38; Günther, Hischke, Meissner, Cross Country Synergies, p. 206 in this book.*

[27] *Cf. chapter Processes, Organisation & IT, p. 304 in this book.*

[28] *Cf. Lischka et al, Telekom goes digital, p. 220; Penkert et al, Telco 2020, p. 246 in this book.*

[29] *Cf. Aumann, Hauk, Obernolte, Protection Services to Safeguard the Digital Everyday Lives, p. 258; Godde, Data Integrity, S. 272 in this book.*

[30] *Cf. Grineisen, Martens, Rehm, Households, p. 280 in this book.*

Partnering and innovation are two sides of the same coin for telecommunications companies. Being attractive to consumers requires innovations that the companies have either developed themselves or that have been developed through more or less close cooperation with partners and monetarized to the benefit of both sides.[32] In view of the dynamics of the market requirements, technological developments, the complexity and multi-dimensionality of future use cases, the intensity of competition, the acceleration of innovation speeds, and the decline in the half-life of solutions, the engagement in partnerships is absolute essential to secure the competitive position. Nevertheless, telcos are called upon to produce their own innovations, especially in those areas that promise a USP or that belong to the brand essence, such as security and data protection, (network) reliability, quality, and service. The task here is to merge the two worlds to create a coherent product whose parts function well together for customers.

The subjects of wholesale and partnering do not lie far apart from each other. Global reach of secured quality cannot be achieved without partnerships or wholesale or wholebuy business models. Wholesale business models are generally precisely regulated for telcos, especially for incumbents. The rules of an elaborate, sector-specific regulatory scheme are applied in those cases in which a position of market dominance is determined. These rules do not apply to players from other sectors such as OTT, even though they are bustling around in the same service areas. Regulation as practiced at the moment is obviously more player-specific and less sector-specific. Telcos in particular must push for "equality of arms" in competition.[33]

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[31] *Cf. Glohr, Telco Focus on Business Customers, p. 288 in this book.*

[32] *Cf. chapter Innovation & Patnering, p. 110 in this book.*

[33] *Cf. chapter Wholesale, p. 164 in this book.*

Assessment of the Telecommunications Sector from the Capital Market Perspective

The turbulence of recent years has not abated – the telecommunications sector is still confronted with elementary challenges. Almost all of the large companies are listed on stock exchanges and must regularly give an account of their actions to their shareholders. How does the capital market assess the current situation, and what are the prospects for the future? What strategies and actions are regarded to be effective in achieving the objectives? **Andreas Mark, Fund Manager for Union Investment, and Wolfgang Specht, Analyst at Bankhaus Lampe,** answer these and other questions.

Interview

Union Investment

Bankhaus Lampe

Question: You have both been involved with the telecommunications industry from the capital market perspective for many years. What do investors and analysts think about this sector at the moment?

A. Mark: The telecommunications sector was characterized in the past by high debt, declining revenues, weak profitability, and reductions in dividend payments. Over the last 24 months, however, the industry has experienced a renaissance in the eyes of investors. The stabilization of profitability, coupled with improved prospects for dividends and (in some cases) a return to revenue growth, has led to a re-assessment of the sector. Moreover, the consolidation in the European telecommunications industry has contributed to a higher appraisal. While the industry was still traded at a discount on a price-earnings ratio basis in 2013, it enjoys today an assessment premium on the market. In the past three years, the sector's price development has exceeded that of the broad European stock market.

W. Specht: Until 2014, the sector suffered from weak revenues and declining margins. A mix of decreasing pressure in regulatory requirements, consolidation steps, and declining price competition brought about a stabilization in the number of customers and in revenues for many companies in the industry from the middle of 2014. The most important assessment criteria improved because of the heightened discipline in costs and investments. All of this has resulted in a "well-deserved" re-assessment of the industry. Investors currently look favorably on the telecommunications industry; this is also a consequence of the growing interest in infrastructure subjects.

Question: What kind of influence do the capital market and banks have on the telecommunications industry when it comes to the challenges of the future?

A. Mark: Challenges mean two things. On the one hand, huge investments must be made in the build-out and performance capability of the networks. On the other hand, the business model must simultaneously be secured in an environment that is changing rapidly. The capital market plays an important role in the financing of these changes. Successful business models and mergers are valued more highly on the stock markets. The telecommunications industry in the USA has been able to set new records for the issue of corporate bonds, for example. At the same time, the capital market asks critical questions about future investments. The credit rating has become an important element of corporate strategy and has led to stricter capital discipline.

W. Specht: Virtually all of the large players in the industry are listed on stock exchanges and make extensive use of the financing opportunities on the capital market. Investors in stocks and bonds today look more closely at the specific business model and strategy. The difference in the time horizons is often problematic. Most investors prefer fast realization of their returns. Moreover, they like glass-clear transparency in the assessment of the recoverability of their investments. This is often contrary to the long-term investment cycles related to investments in the network infrastructure and the uncertainties that remain because of regulatory decisions.

Question: As things stand at the moment, might an unlisted company actually have an advantage on the market?

A. Mark: The transparency regulations applicable to unlisted companies are less stringent, and these companies have the advantage that, under certain circumstances, they can follow a longer-term planning horizon in their investments without having to be so conscious of short-term profitability. Listed companies are constantly under pressure to deliver good results for each quarter.

W. Specht: I agree with the argument that an “unlisted” status can be advantageous during certain development phases of a company. This is especially true when companies are in a “transition phase” such as times of complex integration measures or extensive restructuring processes.

Question: Does the capital market display a high level of willingness to make investments in new network infrastructures? What would have to be done to raise this level, and what investments are considered to be meaningful?

W. Specht: Speaking broadly: there is plenty of money out there. If investors are convinced of the recoverability of an investment, their willingness remains at a high level. Unfortunately, they have suffered a number of disappointments in this respect in the past. Technological trends have proved to be shorter-lived than originally expected, and regulatory decisions have on occasion devalued investments; one example here is the mandatory provision of advance service products to competitors.

A. Mark: The successful creation of infrastructure funds in recent years is evidence of the fundamental willingness of the capital market to accept such investments. Willingness to invest in network infrastructure exists only if there is a prospect of attractive returns on the capital. This undoubtedly presupposes planning security and a regulatory framework that is friendly to investments. Investments that secure the future capability of the company will be supported. The expansion of the mobile services networks so that they can handle the immense growth in data utilization is favored, as is the improvement in the performance capability of the fixed network infrastructure.

Question: Do you see any risk that additional investments will not result in the desired yields because (for example) the threshold of customers' willingness to pay is too low or the regulatory authorities institute unfavorable rules?

W. Specht: Price sensitivity continues to be an issue for telecommunications services, just as in the past, but from the standpoint of the providers and in view of the price development of the primary services, the worst appears to be behind us. Service revenues of mobile service providers have recently stabilized after years of decline, and subsidies for the acquisition of new customers are being cut back. Regulation in Germany and Europe has also become significantly "more plannable". The so-called "ex ante regulation" that was applied even before the introduction of a service has been reduced in part and revised in favor of "ex post control".

A. Mark: Investments make good sense above all when they create added value for which customers are ultimately prepared to pay. A sudden change in demand behavior and customer needs can have a negative impact on the profitability of investments. In the telecommunications industry, changes in regulations represent the greatest risk for investment decisions. So it is understandable when companies delay in making investments if the profitability of the investments is not assured.

Question: Do you believe the subsidies the German government has decided to provide, especially for the expansion of broadband services in areas where coverage has been poor, are reasonable?

A. Mark: No one disputes the necessity to provide high-performance Internet access for everyone. Private businesses cannot be expected to bear alone the investments for coverage in inadequately supplied areas when they will suffer a loss. The state should step in here so that it can reach its goals by 2018. However, access to these networks must be assured for competitors. The decisions about the subsidies have already led to investment commitments on the part of the telecommunications industry.

W. Specht: The subsidies of €2.7 billion that will be provided by the national government by 2018 are an important building block and, along with the subsidies from states and municipalities, will stimulate expansion in the inadequately supplied areas. The release of the funds, however, has been relatively late, and meeting the political objectives by 2018 will consequently be touch and go. Moreover, this objective of full-area coverage with bandwidth of at least 50 Mbit/s cannot be more than an interim goal. To this extent, I assume that further subsidization funds will be created. The German government has also announced its initial deliberations in this direction. Beyond 2018, however, the subsidies will move more in the direction of FttB/FttH while the current actions are technology-neutral.

Question: What should a company on the market think about when deciding on price strategy?

A. Mark: Company size, network quality, market structures, market positioning, product variety, and target groups are important parameters for deciding on the pricing of products and services on the market. Integrated telecommunications companies can take advantage of the synergies from the operation of mobile and fixed networks to provide the network with the best quality available on the market. This position makes it possible for them to demand corresponding price premiums on the market. Moreover, the provision of attractive products and services from a single source creates additional differentiation and enhances customer loyalty. Large integrated players attempt to raise the level of customer loyalty by offering attractive bundles of services encompassing mobile services, fixed network, and TV. Such offers can be sold only if they include a discount, however. Fixed network-only providers and mobile-only companies will attempt to attract customers through quality, service, and attractive pricing. Specialized, smaller providers with free capacities can try to gain market share through aggressive pricing. No matter what the company, however, the focus is on the increase of revenue per customer. This can be accomplished by encouraging higher data use through attractive rate plans, supplementary products, or (as has been observed recently) through price increases in conjunction with supplementary services in so-called “more for more” offers.

W. Specht: There is no such thing as a panacea – unfortunately. A number of factors, including individual positioning, targets, and behavior of the competition, are decisive. No major changes in the price strategy of the various players have been observed on the German market in the last twelve months. Price increases have been carried out here and there, but they have often been coupled with the granting of more service. The time periods in which the lower promotion prices apply have in part been curtailed, and there is less emphasis on subsidizing hardware.

Question: We have seen a number of different consolidation activities in Germany in the past two years. Do you think they are sensible? Will there be any more?

A. Mark: We have seen various consolidations in the last few years, and from a company perspective, all of them – when viewed individually – have been sensible. The acquisition of the cable network operator Kabel Deutschland by the mobile services provider Vodafone was aimed above all at strengthening the latter's own fixed network activities and in closing the gaps in its own product portfolio. The merger of E-Plus and Telefónica Deutschland, two mobile providers, demonstrates how a lack of size in an intensely competitive environment must be compensated by mergers. In the cable network sector, Telecolumbus has acquired Pepcom and Primacom, further consolidating the network provider segment, with the objective of generating important synergies through size. The most recent investments by United Internet in Telecolumbus and Drillisch indicate that the telecommunications market remains fluid and that this development has not yet come to an end.

W. Specht: This appraisal of the four most important transactions is highly accurate. I expect to see further consolidation activities in this country, especially among the cable networks. The history of this segment means that there are still a lot of small network operators whose business model will face difficulties in the middle term because of the need for investments. Various network operators at the local level, the so-called city and regional carriers, will join with larger units. We see Versatel in the role of an active consolidator here. Moreover, we see the acquisition of Drillisch by United Internet as highly logical in industrial terms.

Question: Both integrated carriers like Deutsche Telekom or Vodafone and specialized carriers like Telefónica Deutschland or Unitymedia are active on the German market. Do both of these business models have a future?

A. Mark: Even specialized business models have a future in an increasingly convergent world. There will always be customer groups who want to purchase only one product, i.e., either mobile or fixed network, from different providers. Price sensitivity and customer service play an important role in this case. Moreover, the buying decisions usually take different paths according to product. The purchase of a fixed network product is a buying decision for a household that is decided only once for the entire family. In contrast, the decision about a mobile network provider will often see the individual family members moving in different directions because of differing motivations. The fully integrated carrier can very quickly and simply offer products from a single source with the corresponding price advantages – this is where its strengths lie. Both business models are subject to change in a competitive environment that is in a state of flux and will have to be adapted according to their future orientation.

W. Specht: Integrated business models that have reached a critical mass within their market and that are well managed certainly have a future. I have a tendency to prefer the "fixed network-based" carriers among the specialists. My reasoning is that "mobile-only" network operators can become subject to pressures on the cost side of business. If traffic growth forces them to raise significantly the density of their antenna structure, they run a risk of not being able to install the additional antenna at a favorable cost because they do not have access to their own fixed network infrastructure.

Question: What do you see as the most important drivers and hurdles related to consolidation among the telecommunications companies in Europe? Are we about to see a "consolidation wave"?

W. Specht: At the moment, "cross-border mergers" are hampered especially by a lack of synergy potential. This could change in the middle term because of a gradual standardization of transmission technologies and a uniform regulatory framework. I would also not exclude the possibility that in the future buyers whose core business is outside of Europe will appear as buyers in Germany. One reason for this could be the desire for a regional differentiation, consigning synergy expectations to a subordinate role.

A. Mark: So far, we have seen only "in-market" consolidation in Europe. Most of the mergers have been between mobile and fixed network operators among themselves or the combination of fixed network and mobile companies. Major drivers have been improved profitability achieved by scaling effects and an expanded product portfolio. Cross-border mergers have been hindered up to now by the lack of synergies and the differences in national regulations and legislation. Such hurdles could be taken with the harmonization of regulations across all of

Europe, especially in relation to the awarding and terms of mobile spectrum. At the same time, the challenge to the previous business models coming from OTTs such as Facebook and Google could cause a turning towards "greater size" in Europe. Once the first cross-border merger has been completed, others will follow.

Question: What dos and don'ts should players take to heart if they want to be attractive to the capital market in their consolidation scenarios?

A. Mark: As far as the capital market is concerned, the important point during consolidation is a strategy that is inherently consistent and logical. It must be able to generate value over a long term. Strengthening a company's own assets by acquiring complementary products or services can increase value just as well as "in-market" consolidations. Justifying expansion into other regions and business areas outside of the company's own footprint, on the other hand, is difficult.

W. Specht: The "passive role" can also be interesting. If a company is able to position itself as an attractive target for acquisition, investors will often add an "acquisition bonus" to the fair value.

Question: How important are cooperative ventures among telecommunications companies as a kind of substitute for a consolidation? In what areas do cooperative ventures among carriers make good sense?

A. Mark: Cooperative ventures help to compensate for a lack of size and for gaps in the product portfolio. They help to reduce costs through joint purchases (equipment), collaboration during network build-up, development of products, or joint acquisition of content. Items that are lacking in the product line can be acquired from a provider on the basis of wholesale agreements. The "make or buy" decision is highly dependent on the terms and conditions that can be agreed so that it is possible to offer a product at a profitable price.

W. Specht: In the future, there will presumably be closer collaboration between mobile-only network providers and fixed network-only providers as a means of balancing out the advantage held in some areas by integrated providers. There is already a reciprocal relationship of this type between Telefónica Deutschland and Unitymedia, for instance.

Question: How great a threat for various carrier business models do you see coming from OTTs?

W. Specht: The threat from OTT business models is in the meantime probably greater than the competition among the carriers. Among other factors, this has come about because the first "attacks" were extraordinarily successful – messaging platforms versus text messages or streaming platforms versus carrier libraries, for instance – and because the financing opportunities created by good core business have become even better – Alphabet or Facebook are such examples. The speed in the development and dissemination of new OTT models has recently accelerated, and this has made the response opportunities for telecommunications companies more complicated.

A. Mark: OTT players are both a blessing and a curse for the telecommunications industry. On the one hand, providers such as Netflix, whose services previously did not exist on the market, are stimulating the use of data and improving the sale of higher-quality broadband connections. But on the other hand, the introduction of disruptive services such as WhatsApp have eroded the business models of voice and text messages. Integrated telcos are better able to respond to this threat than pure plays, i.e., mobile-only or fixed network-only providers.

Question: How can the relationship between carriers and OTT players be successfully structured from the carrier perspective? How important are vertical partnerships with OTT players?

A. Mark: Successful carriers have the chance to secure a competitive advantage for themselves by entering into partnerships with OTT players. Such partnerships should be designed to bring about a "win-win" situation. The OTT profits from the carrier's network quality and reach. The carrier can innovatively design its product portfolio and benefit from the brand awareness of the OTT player. Great care must be exercised when selecting the partner. From the customer perspective, only leading OTT players come into question.

W. Specht: Unfortunately, most carriers must be satisfied with focusing on "connectivity", although they do not have to give up completely their desire to offer some additional content. The carrier provides the "transport platform" and aggregates a number of different services simultaneously for the customers, but most of these services have been procured from partners. The result (for example) is a package of network access, data volume, security solution, and content. It is important to retain the customer or billing relationship.

Question: In contrast to many other markets, a large share of the market in Germany is held by resellers and virtual network operators. How would you appraise the outlook for these market players?

A. Mark: There has already been some consolidation among the resellers in recent years. That is indicative of the competitive pressure that exists in this industry. It will become more and more difficult for players to maintain their independent positions in an increasingly convergent world. If the mobile product is not differentiated by its quality, it threatens to develop into a commodity, and price competition will move to the forefront. In that case, size and distribution will be the decisive elements on an extremely competitive market. Some resellers have already begun to diversify their product line or to develop new distribution channels.

W. Specht: Consolidation has indeed advanced a long way in this area. freenet, United Internet, and Drillisch are the only three players with relevant market shares who are still around. I would classify other "virtual network operators" such as "Aldi-Talk" or "Fonic" more as sub-brands of the network operators. I consider all three business models to be sustainable, but I see highly logical arguments for a merger of United Internet with Drillisch.

Question: On the subject of regulation: Do you expect any major changes for the German telecommunications market? Who could profit, who is less likely to benefit?

A. Mark: We expect a continuation of the investment-friendly regulation in Germany as a way to encourage the expansion of broadband coverage that is needed. There is little need for action in this area because of the consolidation on the German mobile market. Companies that are prepared to make extensive investments will profit from the regulation. Large integrated players will be able to secure benefits from it because of their network coverage. The government subsidies and the related provision of wholesale products will also open up access for smaller companies and resellers. Regulation has a particular responsibility with respect to pricing.

W. Specht: The most recent significant decisions (about vectoring, for example) and the regulations for the awarding of subsidy funds tended to favor the large operators. In view of what we hear from politicians, the drafts for regulation directives, and statements at the European level, I also believe that future regulation will probably be "more incumbent-friendly".

Andreas Mark has been working in portfolio management of stocks at Union Investment since February 1998. He manages European stock orders for institutional investors and is in charge of the analysis of European and North American telecommunications companies. From 1988 to 1998, Mark worked as senior portfolio manager at DZ Capital Management, where he was responsible for the management of European equity funds and mixed portfolios. Parallel to his work, he earned a degree as a banking spe-cialist at the Bankakademie (today: Frankfurt School of Finance and Management). Mark previously participated in a trainee program in the securities department of the DZ Bank and concluded his vocational training as a banker.

Wolfgang Specht studied business administration in Essen. He began his professional career as a strategy consultant in the telecommunications and media industry in 1996, when he began working for a subsidiary of Deutsche Telekom. He became a sector specialist and changed over to the sell side in 2000. He has acquired more than 15 years of experience as an equity analyst in the sectors telecommunications, media, and Internet while working at DZ Bank (Frankfurt), Oppenheim Research (Frankfurt), WestLB (Düsseldorf), and Bankhaus Lampe (Düsseldorf). His work in these positions has included the guidance of various ECM transactions.

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September
October
November
December

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Bankhaus Lampe

5G – New Opportunities?

Falk Schröder, Rachid El Hattachi

> Digitalization is coming along with new opportunities and challenges related to a wide variety of use cases that will emerge.

> As a consequence, 5G has to be built around and fully optimized for flexibility to deal with a divers set of use cases and requirements.

> 5G should be a technology that will be based on one global standard. Operators have a duty to drive all industry players to deliver a 5G eco-system that is free of fragmentation and open for innovation.

Mobility and the Internet have had a massive impact on our society. In the last decades we brought mobility to billions of people. Thanks to LTE already billions of people are already connected to the Internet through their smart phones and tablets and are consuming a massive amount of data leading to year on year global data traffic growth of more than 50%.

Roughly six years after the launch of the first commercial network based on the fourth generation standard 3GPP Long Term Evolution, main representatives of the wireless ecosystem are striving for finalization of the requirements definition phase for 5G. Some operators have already announced 5G plans for 2017 and 2018. A well-defined requirements profile shall serve as a stable foundation for developing a sustainable 5G eco-system.

But what is 5G about to address? First of all, operators have the constant challenge of managing exponential traffic growth. At the same time, the pressure to reduce operational expenses and maximize spectrum utilisation is increasing. Therefore 5G, as a basic requirement, should support a massive increase of data traffic at higher spectral and cost efficiency levels.

In a wider context, 5G is supposed to be the engine and the backplane of almost all aspects of a fully digital society. Digitalization is coming along with new opportunities and challenges related to a wide variety of use cases that will emerge. 5G will allow operators to address new categories of use cases beyond today's mobile broadband. These use cases range from connecting billions of Things in a highly interconnected IoT world, to addressing highly sophisticated use cases around the so-called Tactile Internet.

These use cases that we will discuss further in this article, bring along requirements that go beyond just pure traffic volume or higher bit rates. Moreover, these requirements are not uniform across all the use cases, but nevertheless have to be supported concurrently. Therefore, diversity of use cases and their inherent requirements will characterize and drive the design of the 5G eco-system.

As a consequence, 5G has to be built around and fully optimized for flexibility to deal with a diverse set of use cases and requirements. This is substantially different from the way previous generations have been designed. Previous generations have been designed with a certain dominating use case in mind and have been optimised for that specific use case (i.e. 2G for voice, 4G for Mobile Broadband). Supporting emerging use cases like IoT requires already certain changes to the LTE stack. As a matter of fact, 3GPP is already designing a new standard to support the demand for Internet of Things in 4G prior to the emergence of 5G.

Much more relevant than ever before, to enable a fully digitized society and to properly design the 5G eco-system, it is essential to understand the business and customer context moving forward. This allows to create a holistic view on potential use cases and with that the level of flexibility and the architecture required in a 5G system.

5G context and use cases

Today's mobile networks provide capabilities that allow for a consumer experience across various applications in a Smartphone-centric eco-system. However there are specific use cases that need explicit improvements in terms of network capabilities. These use cases cover the consumer space, B2B as well as the emerging digitalization of vertical industries.

Today's digital natives will be tomorrow's 5G customers. These customers are always connected. They do not only consume, they also generate a big amount of content and are highly interactive and constantly online. The amount of devices that consumers will have around them will dramatically increase. It is expected that consumers will have more than 10 personal devices that are concurrently in use. Those devices will differ in terms of network capabilities, functions as well as the type of data they collect or generate. The development of consumer electronics will open up completely new use cases and experiences like Virtual Reality and Augmented Reality. All these developments will dramatically change the way we communicate, the way we educate ourselves and in general the way we experience many aspects of our lives.

Enterprises will continue to drive for more agility, increased productivity and higher production efficiencies. At the same time the relevance of security and business continuity will remain very crucial for the future enterprise. Likewise, Industry verticals are mobilizing their applications and digitizing all aspects of their business and customer processes.

5G is positioned as a key enabler in delivering these new digital experiences in a highly digital society.

VR/AR applications

Virtual and Augmented Reality will enable new experiences and will be used to create many applications in the consumer as well as in the office space. Gaming is today already one of the applications where low latency matters. VR gaming requires instant processing of multi-sensor data and gesture tracking in combination with instant overlays of information. This will allow for new gaming experiences. VR/AR will also change the way we consume content as more and more content will be made ready to be consumed with VR devices. In an office environment, it is envisaged that new ways of communication and collaboration will emerge. This will involve Gigabytes of high resolution 3D data being exchanged to enable interactive work among colleagues working remotely at different locations.

These new VR experiences require high computing power, combined with low latency interactions. 5G, with its low latency targets and the introduction of edge computing will accelerate the adoption of VR/AR use cases.

Internet of Things applications

The prospected dynamics of the so-called Internet of Things connecting billions of machines, sensor networks or human wearable devices will extensively penetrate into almost all sectors of economy, propelling the envisaged next step of industrialization.

It is envisaged to have new use cases based on new types of M2M (machine-to-machine) and Person-to-Machine communication (Hyper connectivity & Internet of Things) with real-time constraints, enabling new functionalities for traffic safety, traffic efficiency or mission-critical control especially for industrial applications. These new applications shall however demonstrate a vast diversity of requirements besides higher data throughput and lower delay time comparing to today's communication systems, enabling convergence of many aspects such as complementary fixed network integration, IT platforms and device ecosystems in order to fulfill the network reliability, redundancy, and capacity to serve much more devices simultaneously. 5G will need to efficiently accommodate billions of IoT devices with low energy consumption requirements and at a very low cost level of the device itself.

Tactile Internet applications

In the consumer segment, waiting a few seconds for a streaming video to start is not regarded to be mission critical. That is unacceptably slow for Tactile Internet scenarios where every millisecond counts. Tactile Internet encompasses use cases like autonomous driving, cloud-controlled robotics and other Industry 4.0 use cases. Tactile Internet use cases require very low latency as low as 1ms and/or high degree of reliability, availability and guaranteed QoS.

In autonomous car applications vehicles communicate with the outside world, connected to a network incorporating a traffic management system. The benefit obviously consists of reducing the potential for human error while travel at higher average speeds. The delay time to provide information with a command-response time close to zero is vital for operation. In addition to the latency requirement autonomous cars would also require full-road network coverage with highest possible degree of reliability to be a viable proposition. Tactile Internet addresses also use cases in the health care sector. As an example, a robot surgical system generally consists of one or more arms (controlled by the surgeon), a master controller (console), and a sensory system giving feedback to the user. For example, an operation could be performed by a robot that is remotely controlled by a surgeon at another location. Other applications like cloud-controlled Robotics in smart factories are also enabled due to the tactile capabilities of 5G.

Based on the context as described above, 5G will be at the heart of many digital transformations ahead of us and will deliver value for consumers, enterprises, emerging verticals and society as a whole. These transformations will also bring along new business models that need to be analyzed from the role that operators can have in the overall value chain. Clearly connectivity is a basic requirement across the board, but it is also quite apparent that new capabilities have to be developed to cover the full scope of requirements.

5G capabilities

As analysed in the previous parts, the requirements on 5G systems are diverse paying tribute to the fact that various use cases have to be considered. This illustrates the challenge ahead of the standardization bodies in defining a global telecommunication system that does not only employ and incorporate new technological concepts aiming at improved performance to be experienced by customers and realizing economical superiority in terms of network operation.

Historically every new generation of mobile technology was designed to deliver better performance beyond what the evolution of its predecessor could bring. 5G should improve the performance envelope for mobile communication by a magnitude that might not be feasible with LTE and its evolution. The most common performance requirements as identified by leading industry experts are summarized below. Partially, the requirements have been defined relative to the (initial) 4G technology capabilities:

> 1-10 Gigabit per second (Gbit/s) per connection

> 1 millisecond latency

> 1000x better capacity

> 10-100x better connection density
(number of connected devices per geographical area)

> (Perception of) 99.999% availability

> (Perception of) 100% coverage

> 1000x more capacity at half of the energy consumption

> Up to ten year battery life for low power, machine-type devices.

The abovementioned performance requirements might need a redesign of (parts of) the network. For example, adding more capacity to the system might require getting access to spectrum beyond 6 GHz (centimeter and millimeter waves). This requires more research in terms of channel characteristics and might require new waveforms and protocols. Realizing 1 ms latency requires further optimization of the radio stack as well as leveraging edge computing. Furthermore, densification of the network will require a fundamental and radical new approaches to deploy small cells at an economically viable way.

Obviously connectivity will always be at the core of what 5G has to offer. However, connectivity has to be enhanced and be highly differentiated including on-demand capabilities like latency, speed, reliability and the likes. This so-called enhanced connectivity needs to be enriched by capabilities like security, privacy and a more consistent experience. Capabilities like QoS, Charging and context will enrich many services and applications at the benefit of 5G users.

5G will have to encompass a comprehensive and E2E view on the network. Just offering better connectivity will not satisfy the overall set of requirements. 5G should be therefore be built for a beyond connectivity paradigm. 5G should cover the 3C's; Connectivity, Computing (at the edge) and a Capability set that all together are delivered on demand and in a very flexible way to match the requirements of a specific use case within a certain context in highly digital society. This is reflected in Figure 1.

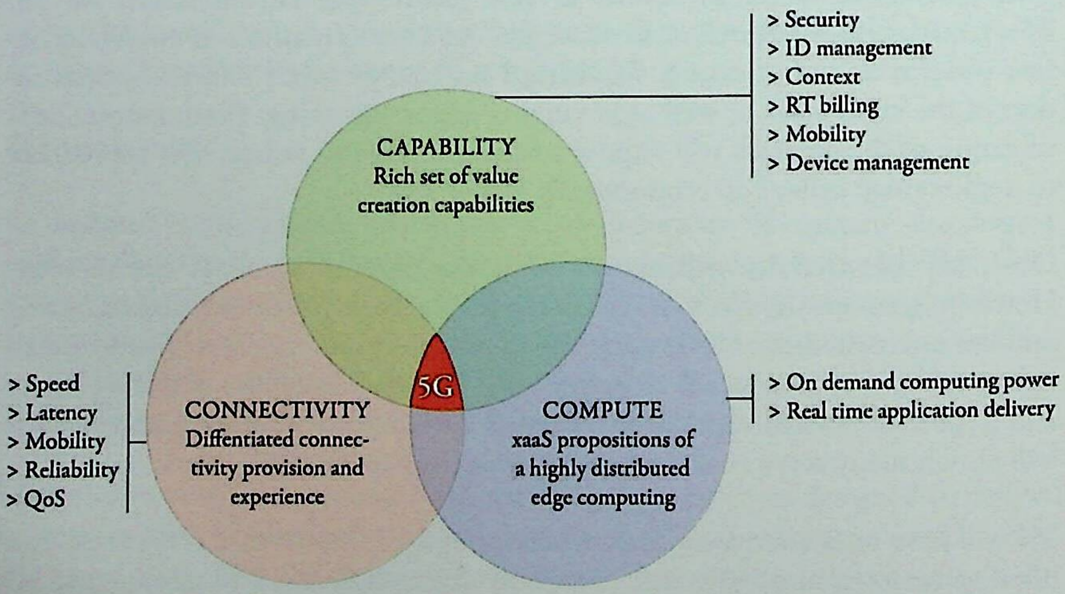
The 3C's that constitute the 5G key assets can be assembled into a holistic and virtual network optimised for a certain purpose/use case. This is referred to as Network Slicing and is explained in the next section.

5G architecture

The Next Generation Mobile Network (NGMN) 5G white paper, published in March 2015, can be seen as a reflection of operators' vision on 5G and related requirements. NGMN is an operator-driven alliance consisting of global operators like Deutsche Telekom (chair), AT&T, Telefonica, China Mobile, Orange, Vodafone and many others.

NGMN's architecture as reflected in Figure 2, consists of a three-layered structure including Infrastructure resources layer, business enablement layer and a business application layer to enable various use cases in parallel.

Figure 1: 5G Key Assets

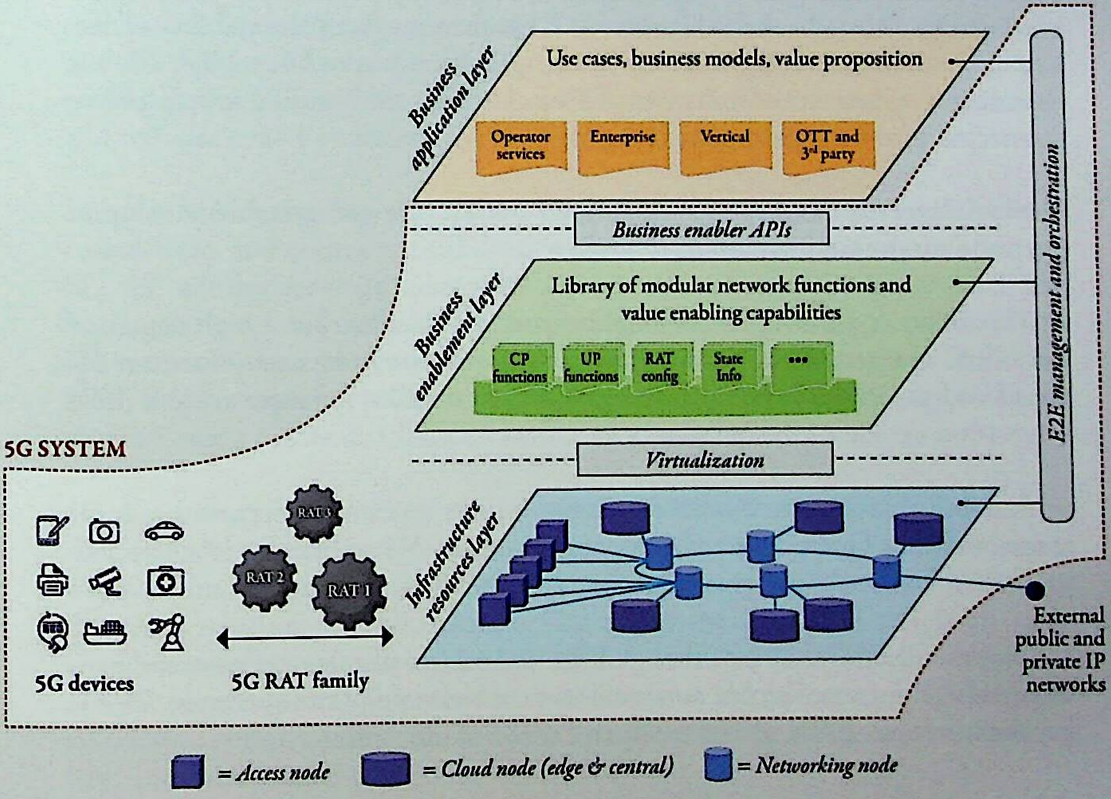

> Security
> ID management
> Context
> RT billing
> Mobility
> Device management
CAPABILITY
Rich set of value creation capabilities
5G
> Speed
> Latency
> Mobility
> Reliability
> QoS
CONNECTIVITY
Diffentiated connectivity provision and experience
COMPUTE
xaaS propositions of a highly distributed edge computing
> On demand computing power
> Real time application delivery

Source: Detecon

The Infrastructure resources layer composes and abstracts the underneath physical resources and provides them to the upper layers in a virtualized manner. The upper business enablement layer is in charge of the management of the repository of the function building blocks and the corresponding access Application Programming Interfaces (API). The business application layer provides the specific applications and services to the customers (enterprise, verticals etc.). There is an end-to-end management and orchestration entity in the proposed architecture dedicated to overall control and providing the interface dealing with translation between business requirements and network functions/slices.

Network slicing is one of the most prominent concepts being discussed in the context of 5G. Network slicing promises a just-in-time and what-you-need-is-what-you-get delivery of network capabilities to the actual recipient of the

Figure 2: NGMN 5G Architecture


Business application layer
Use cases, business models, value proposition
Operator services
Enterprise
Vertical
OTT and 3rd party
Business enabler APIs
Business enablement layer
Library of modular network functions and value enabling capabilities
CP functions
UP functions
RAT config
State Info
•••
Virtualization
Infrastructure resources layer
E2E management and orchestration
5G SYSTEM
RAT 3
RAT 2
RAT 1
5G devices
5G RAT family
External public and private IP networks
= Access node
= Cloud node (edge & central)
= Networking node

Source: Detecon

resources – may this be in terms of a segmentation that addresses the internal needs of a mobile operator or of its (business) customers. Network Slicing has been presented as an architectural approach to flexibly create a number of virtual networks on a single network platform in a generic way. This will allows creating networks that accommodate for a diversified 5G business context. The traditional black box approach consisting of purpose-built hardware and software as has been applied in the telecoms industry for decades will transform into a software-driven approach based on commercial off the shelf hardware and open source software. This transformation is enabled by technologies like SDN and NFV. NGMN also believes that SDN and NFV will be one of the key enablers for the proposed architecture. In the white paper NGMN also shows an explicit example of multiple network slices co-existing on a common infrastructure.

At MWC in 2016, Deutsche Telekom, together with its partners, showed world's first 5G E2E network slicing demo. The demo validated the viability of network slicing technology. The demo was set up with three "slices": a ULL (Ultra Low Latency) slice, an Ultra Mobile Broadband (UMBB) slice and a Mobile Broadband (LTE) slice. On the ULL slice, DT has demonstrated the viability of low latency by demonstrating a record-breaking 1 ms. On the Ultra High Mobile Broadband, a data rate of more than 1 Gbps has been shown using a Smartphone connected to a base station operating at 60 GHz.

The high level requirements for a viable 5G architecture and its technical solution portfolio can be summarized as follows:

> Flexibility & Innovation: 5G architecture should allow for a high degree of flexibility. The actual implementation of the network can be customized on demand and capabilities should be programmable to allow for exposure and drive innovation on top of the 5G platform.

> Scalability: 5G networks have to serve various types of devices with a huge range in terms of respective amount per device type. 5G architecture shall be able to support connectivity between millions of machines, cars, sensors etc.

> Global scale: 5G shall be a true global standard free of fragmentation and promotes a high degree of global harmonisation of technology and spectrum. This is key for interoperability, global reach and speed of innovation.

> Integration: 5G shall allow for a smooth integration of existing network assets and technologies. Through a comprehensive approach, 5G should integrate existing technologies like LTE and Wifi to cover fixed, nomadic and mobile scenarios.

> Security and Privacy: 5G networks shall be designed with integrated security and privacy measures, covering all aspects of devices, connections and applications involved in the 5G eco-system.

Besides the above mentioned technical requirements a future-proof 5G architecture shall have also the inherent capability to adapt to new business models avoiding cost-intensive and time consuming standardization and development cycles.

Way forward for an operator

A look back in terms of key characteristics of the previous generations in mobile communications will help to classify the industry debates concerning the role that 5G is assumed to play in the future. Despite all the attention for 5G, it is envisaged that LTE will be the main mobile technology for many years to come and will also evolve to address low latencies and better performance.

Supporting the ongoing digitization wave requires operators to think beyond connectivity and embrace capabilities such as big data, computing, or security. 5G will address new use cases with a fundamentally new design around low latency (below 1 ms), enabled by computing at the edge of the network. Many operators will move to network clouds in the coming years to leverage SDN and NFV. Edge computing will be a natural step to bring cloud to the edge and with that leverage a highly distributed computing capability.

5G is a move towards a new era of communication, which could re-open the discussion of adding new types of services and business models. Other needs triggered by IoT or industry 4.0 are not yet well enough understood to provide the right solution portfolio design. Critical to the design of 5G is an early engagement of operators with the industry verticals to understand the role of 5G and the required technology architecture. However, the potential will differ from country to country and from operator to operator depending on the maturity level and local market conditions.

For operators it will be decisive to review their overall strategy in terms of being prepared for the shift of paradigms connected with the upcoming introduction of a 5G standard. This encompasses the business as well as the technology strategy. The latter one should provide unambiguous answers to the questions whether and how the already existing network technology assets can be embedded into a consistent architecture framework. 5G needs to be justified and therefore part of the overall business strategy of an operator. New concepts like SDN/NFV will most likely happen before 5G gets implemented. Operators will most probably position 5G implementation as the next logical step beyond the transformation triggered by SDN/NFV and address new business opportunities. At the same time, 5G should leverage existing assets as much as possible and provide a comprehensive framework for doing that.

Last but not least, it remains very instrumental at this stage of 5G development to drive for global standardisation. 5G should be a technology that will be based on one global standard. Operators have a duty to drive all industry players to deliver a 5G eco-system that is free of fragmentation and open for innovation.

■

5G

First Mobile Operators Have Launched VoLTE – How Do Late Entrants Learn from their Experiences and Do it Better?

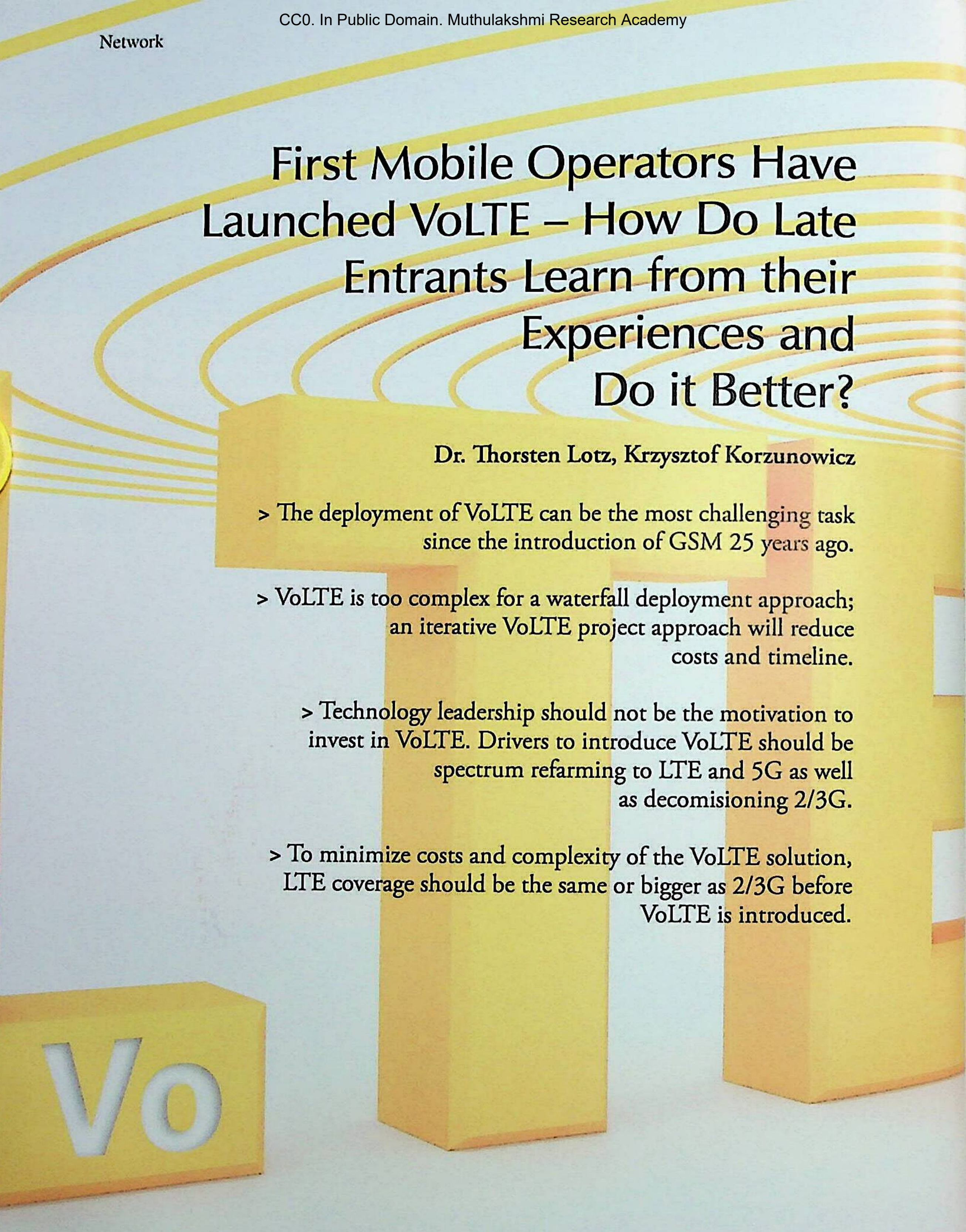
Dr. Thorsten Lotz, Krzysztof Korzunowicz

> The deployment of VoLTE can be the most challenging task since the introduction of GSM 25 years ago.

> VoLTE is too complex for a waterfall deployment approach; an iterative VoLTE project approach will reduce costs and timeline.

> Technology leadership should not be the motivation to invest in VoLTE. Drivers to introduce VoLTE should be spectrum refarming to LTE and 5G as well as decomisioning 2/3G.

> To minimize costs and complexity of the VoLTE solution, LTE coverage should be the same or bigger as 2/3G before VoLTE is introduced.



With Long Term Evolution (LTE) becoming the dominating access technology and smartphones becoming mainstream, the old core businesses of operators – voice and messaging – are being cannibalized by over-the-top content (OTT) providers. To counter declining voice revenues, Mobile Network Operators (MNO) have moved their investment to mobile broadband access even further. With the goal of maximizing the return on investment, they are working to simplify their networks and replace bandwidth inefficient 2/3G with LTE. However, before they can go down this path, MNOs need voice capability on LTE. VoLTE (Voice over LTE) is the most obvious choice to achieve this, but if not introduced at the right moment, it implies additional complexity and costs. The reason is that interworking towards legacy 2/3G networks is required until LTE coverage matches that of 2/3G.

This article explains: why an MNO should and should not consider deploying VoLTE, challenges during integration, when the optimal moment to do it is, and what other options for voice exist.

Business drivers for VoLTE

With the emergence of mobile broadband and smartphones, subscribers increasingly started to use OTT applications like LINE, Viber, Whatsapp, etc. instead of services offered by MNOs. Revenue from mobile voice and messaging decline steadily, forcing MNOs to focus their investment on their network where growth is possible – mobile broadband – even to a greater extent.

To maximize revenues from their most precious asset – radio frequency spectrum – to its fullest potential, MNOs are investing more efficient radio access technologies like LTE and 5G. As an undesired consequence, the rapid rollout of LTE networks and its increasing coverage have accelerated the erosion of revenues for mobile voice. Customers of OTT providers stand to benefit from the improved speed and low latency in LTE, bringing the experience in voice closer to what MNOs provide. In effect, MNOs are on the brink of becoming data pipe providers for third parties, who run their services on top of their network, without incurring any costs. Whereas they must maintain two expensive sets of infrastructures, one mainly for voice and the other for data, while complying with regulatory obligations of the country they reside in.

The major reason for MNOs to invest in VoLTE is the need to decommission the legacy 2/3G circuit switched domain to enable a full spectrum refarming to LTE and 5G for broadband data usage. On the feature level VoLTE services are similar to those in 2/3G and do not compete with OTT, but their goal is to leverage the biggest advantage the MNOs have over OTTs – seamless user experience between all access networks without disruption even in case of network congestion.

Central element of VoLTE is the IP Multimedia Subsystem (IMS), standardized by 3GPP. The IMS core together with Application Servers (AS) enable the service execution for native voice and messaging services in packet switched networks.

Originally IMS was designed access agnostic and it had a natural place in the core of the network as the voice production platform for multiple services, irrespective of access technology. Enhancements to enforce quality of service in mobile packet switched networks and interworking towards legacy 2/3G networks were developed much later. In terms of Fixed Mobile Convergence (FMC) strategy, IMS enables an MNO to converge LTE and DSL VoIP offerings into the same core, causing substantial savings on operations. Beyond this, IMS allows MNOs to leverage infrastructure beyond their premises by enabling voice and text services via any Wi-Fi access. This functionality is called Voice over Wi-Fi (VoWi-Fi). Integration between MNOs cellular voice service and Wi-Fi calling is an emerging trend in the market as technology entrée barriers are low and user acceptance is high. With VoWi-Fi MNOs need to deploy less small cells to provide their services in buildings with poor coverage, as customers take on the task to build their own indoor networks.

Challenges in the deployment of VoLTE

The deployment of VoLTE can be the most challenging tasks since the introduction of GSM 25 years ago. Complexity and technical barriers are high; implementation efforts, timeline and costs are often underestimated.

Of particular importance for VoLTE is the capability to allow voice call continuity, even when leaving LTE coverage and handover to 2/3G is required. This feature is called Single Radio Voice Call Continuity (SR-VCC). Though this feature sounds very useful it has several downsides:

> Complexity related to integration effort towards legacy 2/3G networks.

> Costs and time to implement both on network, as well as IT side, as it requires correlation of charging data records in VoLTE and 2/3G.

> User experience is in reality only “almost” seamless, as there are speech disruptions related to access technology swap every time when used.

Providing seamless handover between all networks is one of the most technically ambitious tasks. Especially in areas with poor LTE coverage, many inter-radio handovers are expected to occur. In the early deployment phase of VoLTE, users are likely to experience higher call drop rates and call setup failures and will see this as a degradation compared to service quality in 2/3G networks. Reaching maturity of SR-VCC takes time and requires additional effort. However, costs and effort spend in SR-VCC will become void, once LTE achieves the same or a bigger footprint as 2/3G.

For the same user experience as in legacy networks, operators tend to deploy the same fully blown feature set, e.g. ring back tone, call completion and multi SIM. This is referred to as "2/3G feature parity". Technical implementation challenges are not considered and often no calculation on the business case to do it is made – as features are dictated by marketing. This requires a complex and a costly integration of Intelligent Networks (IN), which is the service execution area in 2/3G. What is often forgotten is that once the LTE-only status of an MNO is achieved, a transfer of the service execution to the AS becomes the only sensible option for having one service delivery platform. The deployment of VoLTE should be seen as an opportunity to retire non-profitable and no longer needed features. Similar features like in 2/3G can easily be setup on AS layer, setting these up here right in the beginning reduces the effort once a full transition from IN to AS is required.

Other aspects impacting the costs and timeline for a VoLTE deployment are maturity of both the IMS solution and the handsets, as well as virtualization and interworking between IMS and AS components. In the past vendors have developed their solutions at the MNOs premises transferring a lot of the costs related to testing on the MNOs. Interworking between IMS components of different vendors has proven to be a challenge, as 3GPP standards have often been interpreted differently, causing components not to work with each other at initial phases of the deployment. High amount of testing and additional effort was required by the MNOs, who considered to deploy VoLTE early, causing delays until commercial launch of several years and additional costs.

MNOs taking on late the challenges that arise with VoLTE should leverage from lessons learned by choosing experienced vendors. Especially prior to selecting vendors for IMS and AS interoperability tests should be performed. Also taking the same vendor for the new VoLTE components has proven to benefit the timeline and costs of the deployment.

Why not to quickly deploy VoLTE?

In mature markets, large MNOs have deployed VoLTE trying to prove their technology leadership. The truth is that their customers have not even noticed, as their experience is at launch at best the same as in legacy, but it can be worse. A similar statement could be "others have it" that is why "I need it too".

The way many MNOs are currently marketing the fact that they deployed VoLTE is amusing at best: typically a short statement in a local newspaper and a bit longer article in specialized press. The first one completely ignored due to almost identical user experience and the second reaching only a very limited group. The total outcome is having bragging rights on telco conventions. Hence, technology leadership nor "others have it and our customers will run away" should not be the reason behind VoLTE investment.

Beside a very complex deployment of VoLTE with interworking towards 2/3G networks, there are other options for mobile voice services in the future:

> Wait for LTE-2/3G coverage parity, turn on VoLTE and start planning decommissioning of 2/3G networks. This avoids a very costly IN and SR-VCC integration between VoLTE and 2/3G.

> Deciding never to upgrade to VoLTE, if revenues of voice are dropping very quickly. Let them die with 3G or partner with OTT providers to cover the left-overs of voice services.

When the above simplest solutions are not fit for the MNO, then several other aspects should be considered when making the decision. The right time to make the transition strikes a point of balance between:

> The costs of VoLTE, especially SR-VCC and IN integrations and changes in those costs related to maturity of VoLTE solutions,

> need for spectrum refarming for broadband data usage,

> 2/3G end of life dates and possible savings on maintenance costs and

> savings on having a single voice production for fixed and mobile, if applicable.

MNOs that decide to launch VoLTE late, benefit from innovations over the last years. Nowadays, a great number of VoLTE handsets is available from multiple vendors, still for now however limited to high end devices. More handsets are to follow, lowering the entry barriers especially in emerging markets, where device costs are of major concern. Out-of-the-box VoLTE solutions composing IMS core and AS will become available to greater extent, reducing the number of interfaces to be integrated.

For some MNOs it can even make sense to wait until the IMS and AS can be introduced as virtualized or containerized solutions. Network Function Virtualization (NFV) can be applied to almost all components of VoLTE. This enables MNOs to benefit from

> using commercial off-the-shelf hardware and simple expansions,
> reduced time to market, by minimizing the typical network operator cycle of innovation,
> simplified operation, by automated re-configuration and moving network workloads onto spare capacity and
> optimizing the network configuration and/or topology in near real time.

In a virtualized setup, the entire VoLTE solution will most likely be cheaper when considered individually, especially in a small-scale deployment. The reason being that in a joint hardware and software based deployment, the capacity could be multiple times too big for the needs of a small MNO, while a big chunk of the cost will be this dedicated hardware. On the other hand, the price of a license based only virtualized solution will scale according to usage. Also savings on having multiple production systems on single a single platform can be substantial, if done right.

Multiple entrants into the NFV market are allowing to pressure the big vendors to provide solutions that are not only technically excellent, but also more innovative in their approach to the customer and the model under which they are being paid for. In the future, the assumption would be to have the Virtualized Network Functions (VNF) bought from different vendors and just defining the way of chaining them to create an offer for the customer.

Why to quickly deploy VoLTE?

Brownfield operators should notice that there is only one set of circumstances, which justifies a quick rollout of VoLTE, i.e. access networks are already or close to congestion and a relevant part of the spectrum is blocked by voice on circuit switched technology. Spectrum refarming to LTE and 5G is required to increase the service offering of mobile broadband. It is likely that such an operator could create a strong positive business case on VoLTE today.

For Greenfield MNOs the situation is different. This is because almost every smartphone is LTE-enabled, making it easy to embrace a large number of customers. Unfortunately, this does not imply VoLTE handset compatibility and subscribers will use OTTs for voice in data only networks. A deployment of VoLTE should therefore be considered in relation to the availability and costs for VoLTE handsets. Also waiting too long may also make it difficult of taking services back from OTTs.

An agile like VoLTE deployment approach

The introduction of VoLTE significantly differs from any deployment of fixed and mobile services and technologies in the past. For technologies like public switched telephone network (PSTN), 2G and even 3G the implementation of new features for voice services was limited by the speed of their development by standardization bodies, which was rather slow. Additionally the nature of changes in technology, on the example of 2G to 3G, was only enhancing the previous solutions. Thus the complexity of building the 3G voice solution with value added services (VAS), as we know it today, was spread over many innovation cycles and years.

A waterfall based VoLTE deployment assuming 2/3G parity and seamless handover between packet switched LTE and circuit switched 2/3G has proven to be very complex, as it requires creation of a new voice service delivery platform and its integration into many legacy systems. In effect, proceeding with a complete requirements-to-design mapping done in a single step, has turned out to be impossible. In previous technologies, changes were incremental and operators had time to learn how enhancements were to be integrated, whereas the knowledge on how to integrate the entire VoLTE solution needs to obtained first. Unfortunately, this is not something a person fully comprehends after reading design guidelines and standards. It takes months of trial and error to understand all its aspects in conjunction with its interworking towards legacy systems.

To streamline the introduction VoLTE and to allow learning during the project, an agile like deployment approach of VoLTE is of advantage, which divides the complex task of deploying VoLTE into several steps. By applying this approach, the MNO only needs to have a basic understanding of his VoLTE scope and target architecture at the beginning of the project, while only in the steps, detailed requirements are defined and in a design, integration and testing phase the solution is build. Each steps builds on top of previous steps concluding with a friendly user trial in production and a go to market decision. With this iterative approach, learning becomes an integral part of the process allowing constant improvement and handover of responsibilities from design, through build to run. The following steps are big enough to make them sub-projects but small enough to be fully understood during requirements-to-design mapping, resulting in a solid project and resource planning:

> The first step will enable basic VoLTE to VoLTE calling functionality.

> The second step will provide connectivity to other networks, i.e. to allow VoLTE call to and VoLTE to be called from the operator's 2/3G network, PSTN and fixed IMS as well as other operators.

> The third step will enable SR-VCC for seamless handover during voice calls from LTE to 2/3G, when moving out of LTE coverage. This step can be omitted in case of LTE-2/3G network coverage parity.

> The fourth step will enrich the user experience by enabling features know from 2/3G like conference, call waiting and introduce billing.

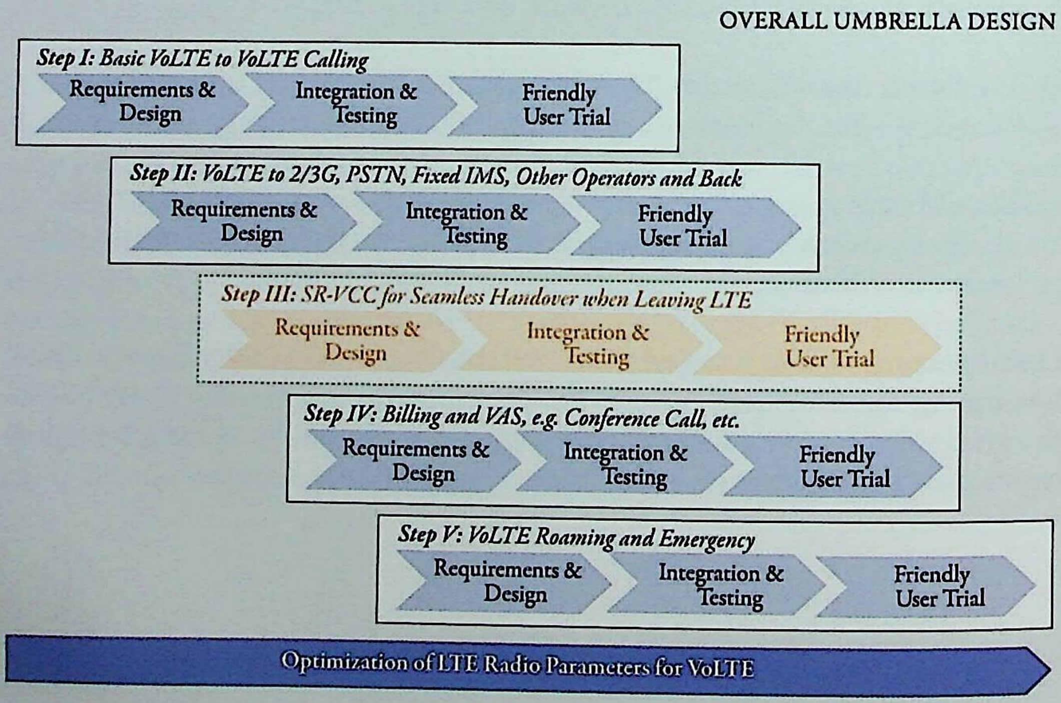
> The fifth step focuses on the deployment of latest features standardized in 3GPP, which are VoLTE roaming and VoLTE emergency functionality with location information.

Due to fact that all steps conclude with a friendly user trial in production, radio fine-tuning can be started early in the deployment. This has shown to benefit the overall deployment timeline as reaching 2/3G-like quality of VoLTE services requires additional effort and time.

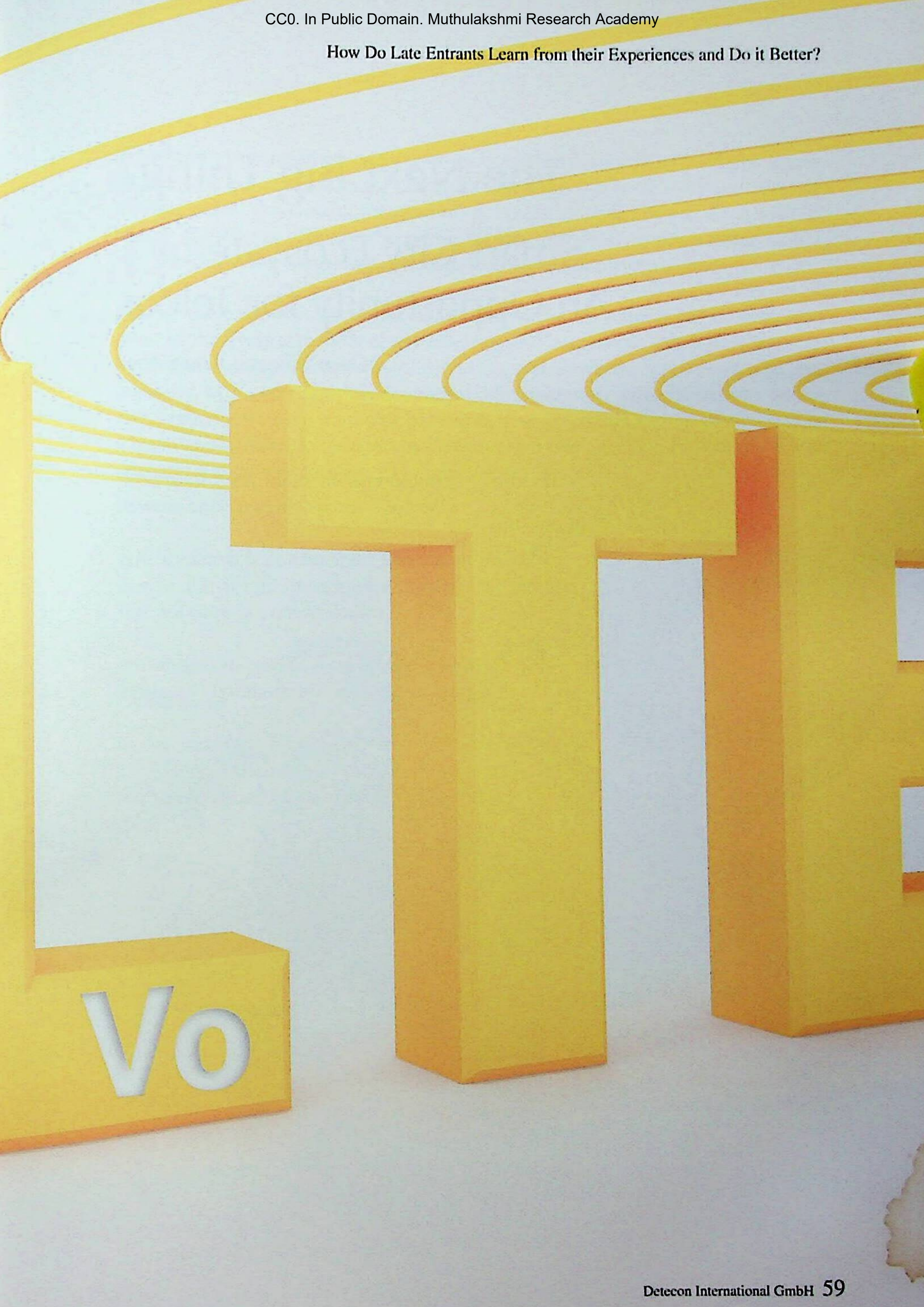
Conclusion

This article presented mistakes and challenges during the deployment of VoLTE in the past. As one of the most important lessons learned it was highlighted, that technology leadership should not be the driver to invest in VoLTE. The deployment of VoLTE should only be driven by the need of spectrum refarming for LTE and 5G and the need to decommission 2/3G networks. If revenues of voice are dropping very quickly, it can also be a rational to never invest in VoLTE and become a pure broadband data provider. MNOs deciding to invest in VoLTE late benefit from mature technology, greater interoperability, lower costs for VoLTE handsets and more experienced vendors. It was pointed out, that reaching 2/3G-LTE coverage parity prior to deploying VoLTE benefits the business case, as no spending in a complex and interim solution for seamless handover from LTE to 2/3G (SR-VCC) is required. Finally, this article concluded with a new, agile like VoLTE deployment approach. With this approach, learning becomes an integral part of the deployment by delivering little by little of the entire VoLTE solution and streamlines the timeline as cumbersome radio optimization can be started early. The figure below shows the described agile like VoLTE deployment approach.

Figure: Proposed Agile like VoLTE Deployment Approach, Comprising of Five Steps


OVERALL UMBRELLA DESIGN
Step I: Basic VoLTE to VoLTE Calling
Requirements & Design
Integration & Testing
Friendly User Trial
Step II: VoLTE to 2/3G, PSTN, Fixed IMS, Other Operators and Back
Requirements & Design
Integration & Testing
Friendly User Trial
Step III: SR-VCC for Seamless Handover when Leaving LTE
Requirements & Design
Integration & Testing
Friendly User Trial
Step IV: Billing and VAS, e.g. Conference Call, etc.
Requirements & Design
Integration & Testing
Friendly User Trial
Step V: VoLTE Roaming and Emergency
Requirements & Design
Integration & Testing
Friendly User Trial
Optimization of LTE Radio Parameters for VoLTE

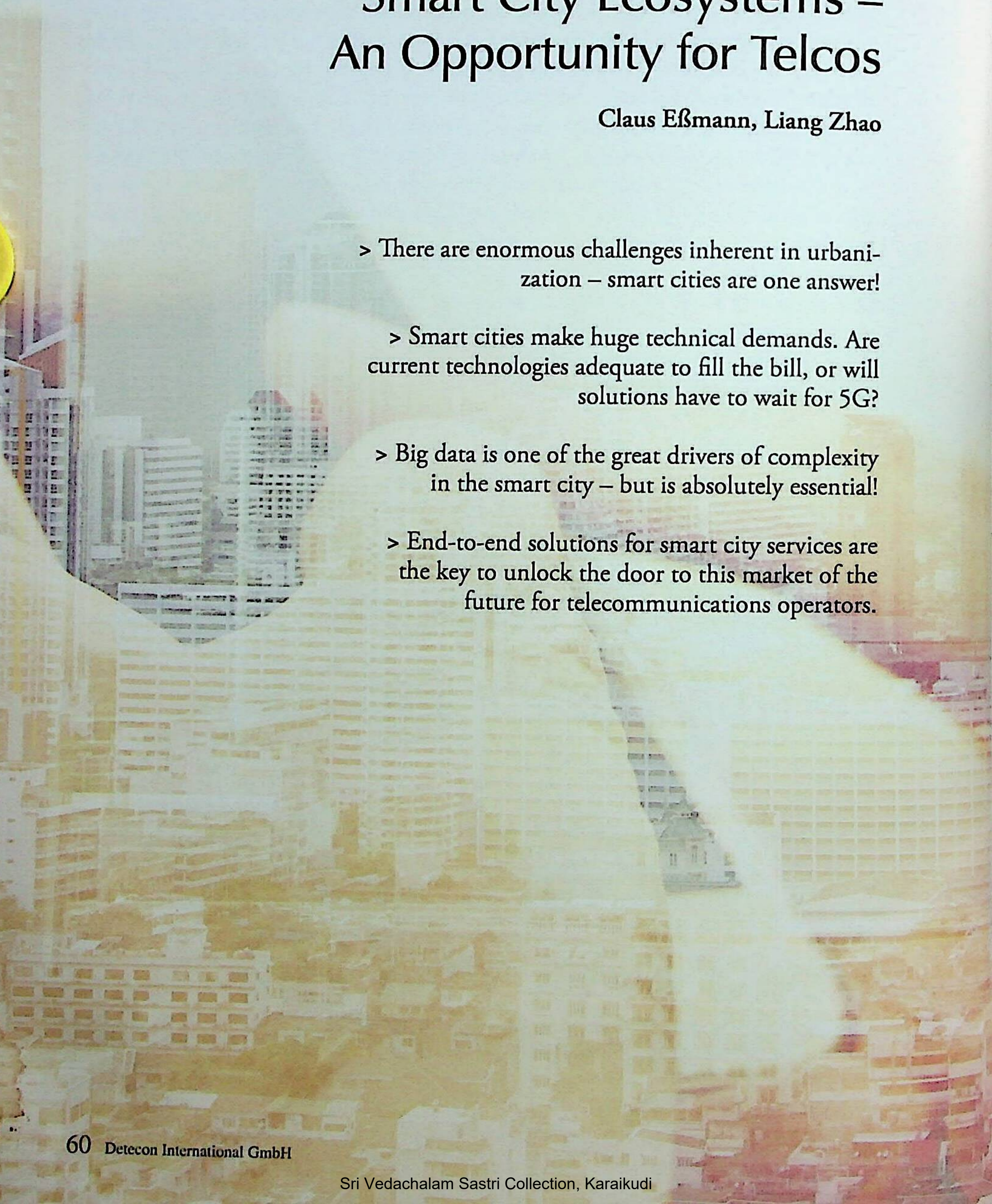
Source: Detecon


Vo

The Next Big Thing?

Smart City Ecosystems – An Opportunity for Telcos

Claus Eßmann, Liang Zhao



> There are enormous challenges inherent in urbanization – smart cities are one answer!

> Smart cities make huge technical demands. Are current technologies adequate to fill the bill, or will solutions have to wait for 5G?

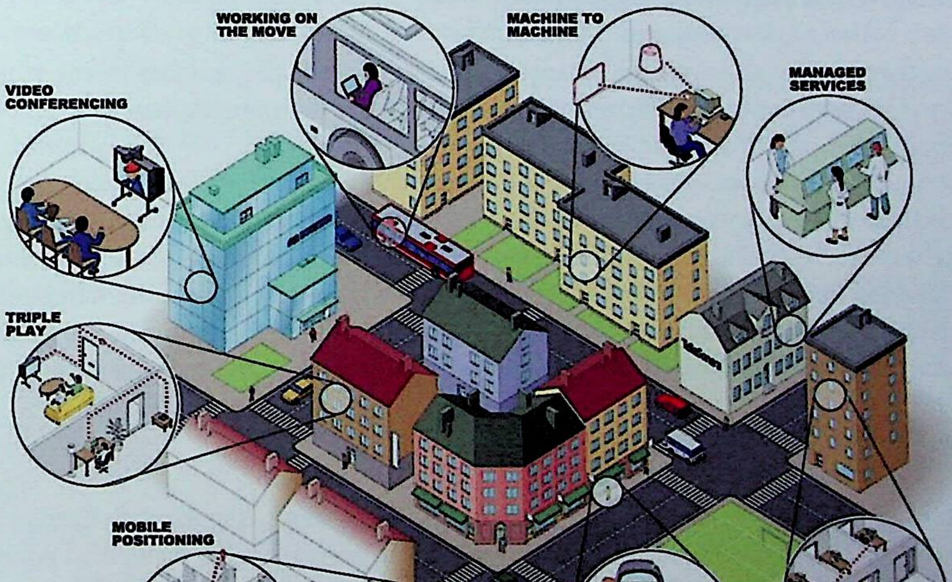
> Big data is one of the great drivers of complexity in the smart city – but is absolutely essential!

> End-to-end solutions for smart city services are the key to unlock the door to this market of the future for telecommunications operators.

Whether an industrialized country or an emerging economy with a large population – the populace in many countries is leaving the rural areas and moving into the cities. This development brings a number of different problems with it: energy bottlenecks that result in power failures, problems securing water supply and sewage, traffic congestion, air pollution, noise, and safety issues.

This is where the concept of the "smart city" comes in. Objectives are improvement in the living standards of city residents and sustainable urban development in general. Any comprehensive solution for a smart city should be promoted and regulated by a corresponding municipal administration with the various necessary departments such as energy provision. The realization can be carried out in a number of phases that are locally distinct from one another. The use of IT and telecommunications technology is a key to success.

Figure 1: Smart City


WORKING ON THE MOVE
MACHINE TO MACHINE
VIDEO CONFERENCING
MANAGED SERVICES
TRIPLE PLAY
MOBILE POSITIONING
3G
WLAN

Source: T-Systems

Business models for smart cities

By definition, smart cities should interconnect all of the data generated in the city so that new opportunities for use of the data can be spawned.[1] The focus of the conceptualization should always be on the ultimate users whose lives will be made easier by the use cases. Are these users the municipal administration that wants to use these networked data to enhance its projections for the use of public services and facilities such as public transportation? Or would it be better to focus these new use cases on the citizens of the city?

Anyone entering this new business field "transformation into a smart city" should think about this from the beginning: Unless there is sufficient acceptance of a smart city and its digital services by the city's residents, it will be extremely difficult to recoup the costs (which should not be underestimated) in a period of less than ten years. In other words, the return of investment would not be reached until a time that is outside the projection periods for most business cases – and even that would happen only if everything ran smoothly because many of the use cases in a smart city are aimed more at gains in efficiency and/or additional attractiveness for the residents.

Another challenge is related to appropriate pricing of the services in the smart city. On the one hand, the service operators want to make money, but on the other hand, there is a limit to the potential users from completely different income classes because the service can reasonably be made available solely to the residents of one city or region. This is a significant difference to Internet services that are freely available to any Internet user. The possible price models for consideration vary widely, from the "freemium" – a basic service free of charge with premium additional services for a fee – to the payment of monthly lump-sum charges along with other municipal levies such as sewage and garbage pick-up.

The "players" in the smart city ecosystem

There are basically three groups in a smart city ecosystem: "regulators", users, and providers. The regional administration and its departments for water and energy supply, traffic planning, as well as security are not only regulatory factors for the development and realization of a smart city, however; they are simultaneously one of the most important user groups that will utilize the available "smart" services for the optimization of city management.

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[1] *Cf. (example) https://de.wikipedia.org/wiki/Smart_City.*

From the user perspective, there are three large groups of users in a smart city: administration, business customers, and private users.

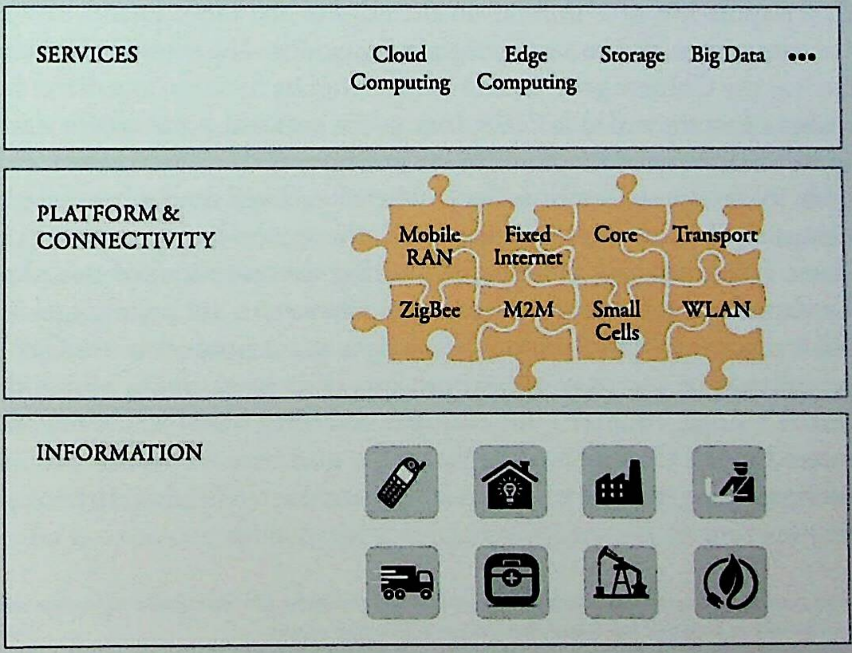
The group of the providers can be broken down into the categories services, platform and connectivity, and information (see Figure 2). Telecommunications providers are in a position to play a number of roles. To do so, however, they must either expand their traditional portfolio of communications services or enter into partnering activities with the appropriate service providers.

The development of telecommunications and IT technologies such as the Internet of Things and 5G with a service-oriented architecture will not only be a decisive driver for the realization of smart cities, but will expand in general the opportunities for services and their offerings in a smart city. As a consequence, the boundaries between the various types of service providers will in the future become more and more blurred

Municipal and regional administrations as service providers and users

There are a number of different factors motivating municipal and regional administrations to drive forward the transformation to a smart city. One of them

Figure 2: The Group of the Providers in a Smart City


SERVICES
Cloud Computing
Edge Computing
Storage
Big Data
•••
PLATFORM & CONNECTIVITY
Mobile RAN
Fixed Internet
Core
Transport
ZigBee
M2M
Small Cells
WLAN
INFORMATION

Source: Detecon

is the optimization of costs that can be achieved by the digitalization of the administration. If the various government authorities jointly maintained a single data storage facility, for example, the savings would be enormous; moreover, the requests for shared data among the authorities that today must still be submitted in writing would become superfluous. Data protection must never be neglected during any optimization, however – during both storage and accessibility of the data.

Further, perhaps even greater, motivation aspects are to be found in the resolution of problems that result from the growing urbanization and the rising "megacities". If they become even more attractive because of these smart services, more and more people will be drawn to move to these cities or regions. In Germany, for example, the size of a city or a community is decisive for the amount of the financial support from the federal government. In the future, a residential area can present a citizen-friendly face by providing genuine advantages to its population in the form of smart city services. Such services include the support of intermodular mobility[2] with central traffic control for the prevention of exhaust gases, an interconnected parking place service, or a functioning garbage pick-up service that utilizes sensors in the garbage bins to determine constantly which garbage bins need to be emptied.

Two current examples from China are worthy of mention here. Yinchuan is a city with a population of 2 million on the edge of the Gobi Desert in western China, far away from the booming high-tech regions. The strategic significance of this city for the Chinese government comes from its function as a driver for the development of western China. That is why the national government has been investing in the infrastructure here for about 15 years. If, as is planned, the city is to be able to develop to ten times its current size, it will need a centralized and efficient municipal administration, and ZTE, the second-largest network outfitter in China, has developed a comprehensive big data solution for this purpose. All of the data from the various government authorities are maintained in this system. This efficiency manifests itself to citizens at a central location, City Hall, where, in contrast to the past, all transactions with government offices can be carried out at a single counter – for example, founding a new company and having it entered in the Commercial Register. The goal here is twofold: serving the citizens and stopping arbitrary actions by government officials and corruption.

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[2] *A passenger travels to the destination seamlessly and without any great delay "door-to-door", using various means of transportation such as buses and trains and carsharing or bikesharing services.*

This was certainly one reason, along with the worry that digital transformation would make it possible to reduce the number of jobs in the administration, why the greatest resistance to this smart city solution came from the government offices themselves and not so much from the residents.[3]

Qinhuangdao, on the other hand, is a city of 2.6 million located four hours by car to the west of Beijing in a region that is well developed economically and technically. In this city, investments have not been made in the digital transformation of the municipal administration, but in the data recording and automation of public life. According to official reports, crime has declined by more than 20% because of the wide-area surveillance of the city with video cameras. Since tourists are an important economic factor in Qinhuangdao, more than 100 information displays have been set up where tourists can interactively find information about local attractions – how great are the crowds visiting the nearby Great Wall of China, for instance. Companies involved in tourism can also profit from the interconnection within the smart city applications and data because of the available analysis of visitor data and an e-ticketing platform provided by the city.[4]

The vision of a smart city is taking on concrete form in China. It might be noted, however, that this is not a place where there is a focus on data security or the private sphere of the citizens.

Network outfitters, system integrators, service providers as partners

Partners within the ecosystem make the technical infrastructure available (both hardware and software). The provision of managed services also plays a large role because the municipal and regional administrations generally do not have the expertise required to operate and maintain the technical ecosystem in all of its facets. It is also possible within this constellation for telecommunications operators, along with system integrators and network outfitters, to take over a larger span of the added-value chain in which the complete range of IoT, cloud, and big data platform services, and not only platform services for (managed) connectivity, are offered (see Figure 3).

One essential question concerning the services for the partners mentioned above asks who has the control over these services with respect to provision and administration and whether these services are implemented on a common platform with standardized interfaces or over the top. In the case of an ecosystem like that of a smart city, it makes good sense (because of the security issues related to data maintenance and data access) to render the ecosystem and the data it contains accessible via controlled interfaces that make the appropriate services available and not over the top. One enormous chance for telcos to remain "in the lead" or to move back into the lead at this point is offered by the standardized interface "WebRTC" that provides telecommunications and IT services on IMS platforms.[5] One point is that core services from telcos can also be made available to third parties easily in this way; another is that the control over applications and services is retained with respect to OTT service providers. WebRTC functions as a kind of "bridge" between the world of traditional telecommunications and the IT world.

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[3] *Cf. c't Computer und Technik, Issue 6/2015).*

[4] *Ibid.*

City and community residents as users of smart services

The residents of the smart city are the actual users of the offered services. These services should have a high level of acceptance among users, and that presumes that the value of the benefits they provide is high. Moreover, a reasonable price model is decisive for success; a service that is too expensive, even if it offers maximum benefit value, cannot be successful in terms of user numbers and revenue and profit. No matter how much thought is given to realizing profits from the services, operators should never forget who is supposed to benefit from the digital transformation of the city into a smart city.

Business customers as beneficiaries of the smart city services

Another large group of users of the smart city services will be the group of business customers because they can profit highly from the smart city ecosystem and services and the conveniences they offer. This is also demonstrated by the example of Qinhuangdao. Many other services within various use case segments could be imagined here. Multiple and diverse examples of applications, however, can be found in the segments automotive, transport and logistics, retail and commerce, construction and manufacturing, and utilities that would optimize and make more efficient the traditional processes and applications of business customers.

Technical requirements and enablers of the smart city

The services in a smart city can be viewed as a collection of Internet of Things services. They comprise a number of basic services: the collection and forwarding of information (e.g., from sensors), the storage of information (e.g., in the cloud), and the analysis and processing of the information (e.g., using big data technology) to trigger the appropriate actions. The technical requirements of the services in a smart city with respect to bandwidth, reliability of the data transmission, and the permitted latency of the network or real-time requirements can vary greatly. So a way must be found to realize these varying requirements at both ends of the scale (high-end v. low-end) while it must simultaneously be possible to store and analyze large quantities of data. The technologies for this broad range of requirements are already available in some partial areas; for example, there is 4G for connectivity and there are cloud and big data technologies for the storage and processing of large data volumes. There is still, however, an unresolved question of whether current technologies such as LTE cam meet all of the requirements, especially the high-end demands, or whether it will be necessary to wait for the next generation of mobile technology (5G).

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[5] *Cf. Goertz, Kuhn, WebRTC: Playing Field for Repositioning of Telcos on the Internet and Web, p. 99 in this book.*

Since we presume that 4G will not be able to meet all of the demands for smart city services, the 5th mobile generation will be a significant trailblazer for smart cities. At the moment, this technology is in the specification stage.[6] Initial "final" specifications are expected from 3GPP (3rd Generation Partnership Project) at the end of 2016. The first commercial implementation that will operate in conformity with standards is planned for 2020; however, South Korea wants to launch the first 5G network in 2018.[7] Even without any finalized 5G specifications, however, it is possible to say now that the 5th mobile generation will not operate simply according to the motto "Higher, Faster, Farther" by increasing the data transmission rates via the air interface.

5G will attempt instead to represent the advanced development of the entire system and to aggregate the most widely differing requirements from the most diversified types of services into one single package. From the technical perspective, the focus of the 5G specifications will be (for example) on device-to-device (D2D) and machine-to-machine (M2M) communications, the virtualization of network nodes and layers using NFV and SDN, and the convergence of fixed and mobile networks. Other scenarios such as the extremely short latency times in the signal propagation delay, very high data transmission rates, or massive D2D communications (e.g., in some connected car use cases) cannot be satisfactorily handled by 4G systems with the current specifications, so hope is placed in 5G specifications here as well.

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[6] *Cf. Schröder, El Hattachi, 5G, P. 38 ff. in this book.*

[7] *Cf. c't Computer und Technik, Issue 6/2015*

From the technical perspective, telecommunications operators are of course not the only parties who can provide connectivity in a smart city. Other players, including OTT service providers like Google or hardware manufacturers like Samsung, are entering the market. Google in particular stands out with an interesting mix of innovative projects such as the Loon Project and more conservative measures like the laying of undersea optic fiber cable. These projects open the doors to new opportunities in the interconnectivity of a smart city, including network coverage. Ultimately, this is an important aspect from the standpoint of an improved customer experience.

LEO (low-earth orbit) satellites are an example of how connectivity that need not come from a telecommunications operator can be provided over a broad area. Several thousand of these small LEO satellites, which at a cost of US$10,000 are relatively inexpensive, are sufficient to provide worldwide broadband connections with transmission rates of up to 1 Gbps in high-frequency bands over 10 GHz – according to Google, about 4,000 in number. The business plans for LEO satellites include marketing activities aimed at both high-end users and business customers (e.g., for tracking of ship containers on the high seas) and the mass market.[8]

An alternative and supplement to connectivity with mobile networks could be communication over low-power wide-area (LPWA) networks. One example here is narrowband IoT, which is currently in the standardization process. This technology is already being regarded today by many as an element of (device) communication that can supplement mobile networks within IoT and smart city.

The expansion of their networks by the addition of LPWA is a natural step for fixed and mobile network providers that will achieve broader network coverage. Moreover, it is a good marketing argument for many IoT services.

But what will the relationship between LPWA and 5G look like? This question is very difficult to answer as long as the specifications for 5G have not been finalized. In view of the high-level requirements of various IoT services, however, it is clear even now that the two technologies can supplement each other to achieve omnipresent and universal connectivity. If this relationship encompassed the 5G specifications for LPWA, telcos would have an opportunity to offer smart services to their customers using standardized, but nevertheless highly different technologies that would (hopefully) complement one another.

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[8] *Cf. Petry, Salem, Satellite Reloaded: How LEOs and the Trend to Commercialization of Aerospace Can Change the Telco Landscape, p. 74 in this book.*

The technology: platforms, protocols, and interfaces

Smoothly realizing and managing use cases on the Internet of Things with a strong relationship to big data – as will be the case in a smart city – will require a number of platforms:

> The "connectivity management platform" for the management of connections and SIM cards is at this time a standard for telecommunications operators. They can market the core products and services of a telecommunications provider at a higher level of the added-value chain – in complete contrast to the wholesale business models that previously sold only the SIMs with an accompaying rate plans to customers.

This platform makes it possible for telcos to bundle their M2M and IoT SIM cards with the appropriate (self-)services such as the ordering, activation, and monitoring of SIM cards. But since in the meantime virtually everyone operates this kind of platform, a price war in the area of managed connectivity has now become possible, even though there are fewer competitors than during the previous one-track marketing of connectivity on the basis of wholesale business models.

> The next stage within the M2M business opportunities is an application-enabling/hosting platform. This platform offers accessibility to software libraries and application programming interfaces (APIs) for developers of IoT services so that they can quickly and easily solve standard tasks such as the retrieval of sensor data or the management of a communications connection and concentrate more intensely on the actual "intelligence" of their IoT applications. This platform can simultaneously host the IoT application and manage the application life cycle so that the service provider/software developer no longer has to provide and administrate the IoT application.

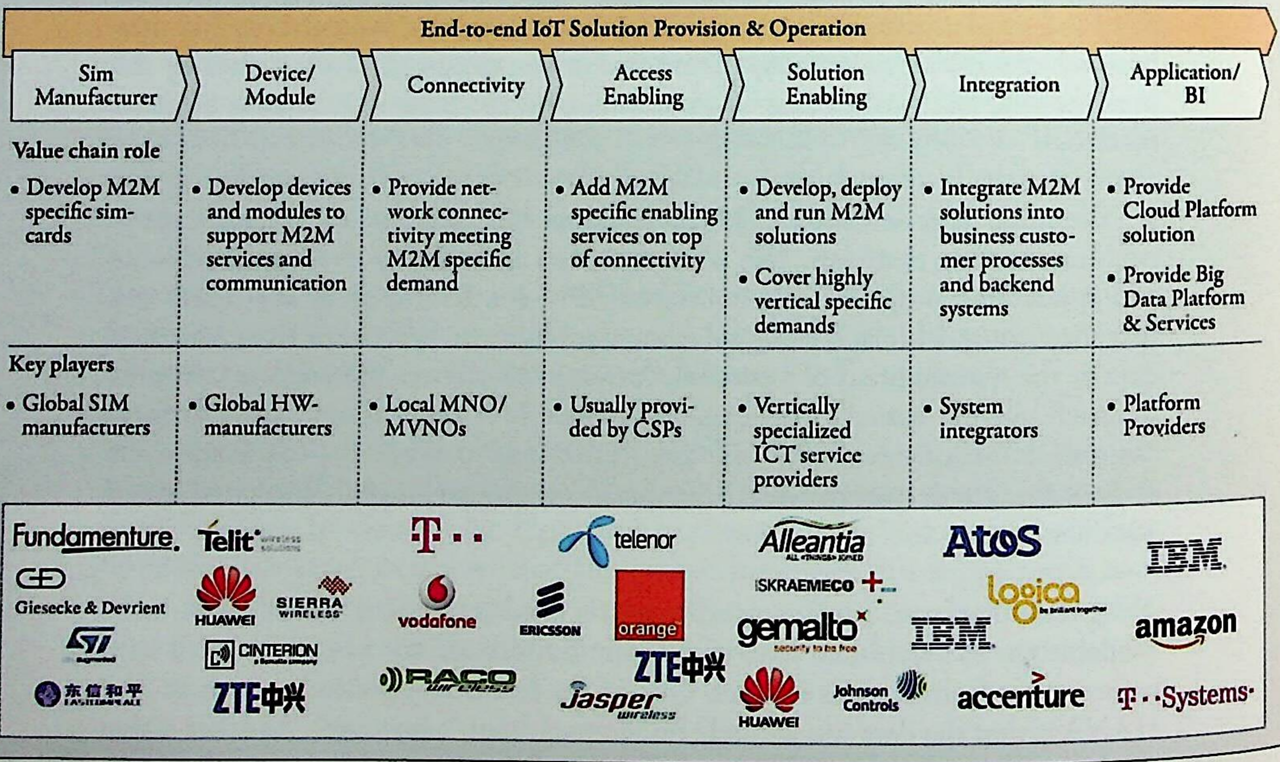
A big data platform, usually cloud-based, is needed to store, analyze, and make available the IoT data that have come from sensors and have been enriched with information from various sources. One of the features of platforms such as SAP HANA is that the data can securely be accessed from "anywhere". Another is that they perform analyses and filtering operations that make utilization of the quantities of data that are generated in a smart city even feasible. Big data technologies are essential for enabling users to process the information that is relevant for them. Most telcos are having difficulties in providing these platforms and databases because they are foreign to the original core business of these companies – "telecommunications". Business with data, however, is generally regarded to be the "next big thing".

The provision and operation of the platforms as well as communication of the various platforms among one another predicate the use of secure protocols and interfaces. Without them, the vision of smart city services will fail to materialize because of the lack of (security) acceptance of users.

Opportunities and challenges for telcos in smart cities

What approach should telecommunications companies now take to the subject of smart services? There are already great numbers of possibilities for

Figure 3: Providers Along the Added-Value Chain



End-to-end IoT Solution Provision & Operation

Sim Manufacturer	Device/ Module	Connectivity	Access Enabling	Solution Enabling	Integration	Application/ BI
Value chain role						
• Develop M2M specific sim-cards	• Develop devices and modules to support M2M services and communication	• Provide network connectivity meeting M2M specific demand	• Add M2M specific enabling services on top of connectivity	• Develop, deploy and run M2M solutions • Cover highly vertical specific demands	• Integrate M2M solutions into business customer processes and backend systems	• Provide Cloud Platform solution • Provide Big Data Platform & Services
Key players						
• Global SIM manufacturers	• Global HW-manufacturers	• Local MNO/ MVNOs	• Usually provided by CSPs	• Vertically specialized ICT service providers	• System integrators	• Platform Providers

Fundamenture.
Giesecke & Devrient
ST
东信和平
Telit wireless solutions
HUAWEI
SIERRA WIRELESS
CINTERION
ZTE中兴
T · ·
vodafone
RACO wireless
ERICSSON
telenor
orange
ZTE中兴
Jasper wireless
Alleantia
ISKRAEMECO
gemalto security to be free
HUAWEI
Johnson Controls
AtoS
logica be brilliant together
IBM
accenture
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technological realization today. The tendency will be for them to increase in the future – the 5th mobile generation and NB-IoT will join them. Since there are so many possibilities, however, it is important to take a very close look to determine which of the technologies can meet the requirements of IoT and smart city services. These requirements, especially in the IoT environment and for smart city, vary greatly among different services. Special attention could be called to the examples near-field and wide-area, latency independence in contrast to extremely short or virtually non-existent signal delay ("zero latency"), or highest bandwidth demands in contrast to sensors that send only a few bits a couple of times a day.

A logical starting point for telcos would be to offer their business and private customers "more" than simple connectivity: end-to-end solutions for smart city services in combination with the corresponding control over the solutions. If they are to be able to offer these solutions, the simple integration of technical systems will not be enough; it will also be necessary to adapt the corresponding processes (which must also be designed to be as lean and cost-efficient as possible) so that the challenge coming from other service providers can be countered.

By taking this step, telecommunications providers would obtain greater control of the (smart city) service market. The offer of modern telecommunications services via a standardized interface – e.g., IMS services via the WebRTC interface – would also enable operators to include services from OTT service providers in the smart city service portfolio without, as previously on the mobile and Internet service market, losing control completely. Cooperation among the service providers is at this point more than just desirable – it is absolutely necessary and a "win/win" situation. On the one hand, the telcos can offer a more extensive portfolio of smart city services, while on the other hand, OTT service providers can offer their applications within the relatively closed domain of the smart cities where (security) rules are much stricter than in the "open" Internet world. One could imagine, for example, a fleet management application from an OTT service provider that accesses the information from the traffic management service of a smart city and can as a result function more effectively than before, while in turn sending detailed information about the route and traffic situation back to the service.

The pricing and business models for services in smart cities might prove to be a genuine challenge. Every player on this market should be keenly aware that user acceptance of services in smart cities will be dependent on more than just the technological circumstances such as available and technical performance capability. It must also be noted that the potential user group for smart city applications is limited and is composed solely of the residents in one city or region. IoT services generally profit from the masses of users of the services because more users also provide more data. This is why the services in a smart city should be priced fairly and not be turned into a luxury service that only a few users can and are willing to pay for. One idea would be to bill the basic services via taxes that are collected in a city in any case and to price more extensive additional services in the form of service subscriptions. Service providers must understand, however, that the return of investment in the sector of smart cities may very definitely extend over a long period of time that can exceed five years because the hardware and software installations as well as the implementation of the necessary (IT) processes necessary for a holistic and comprehensive strategy will require substantial investments.

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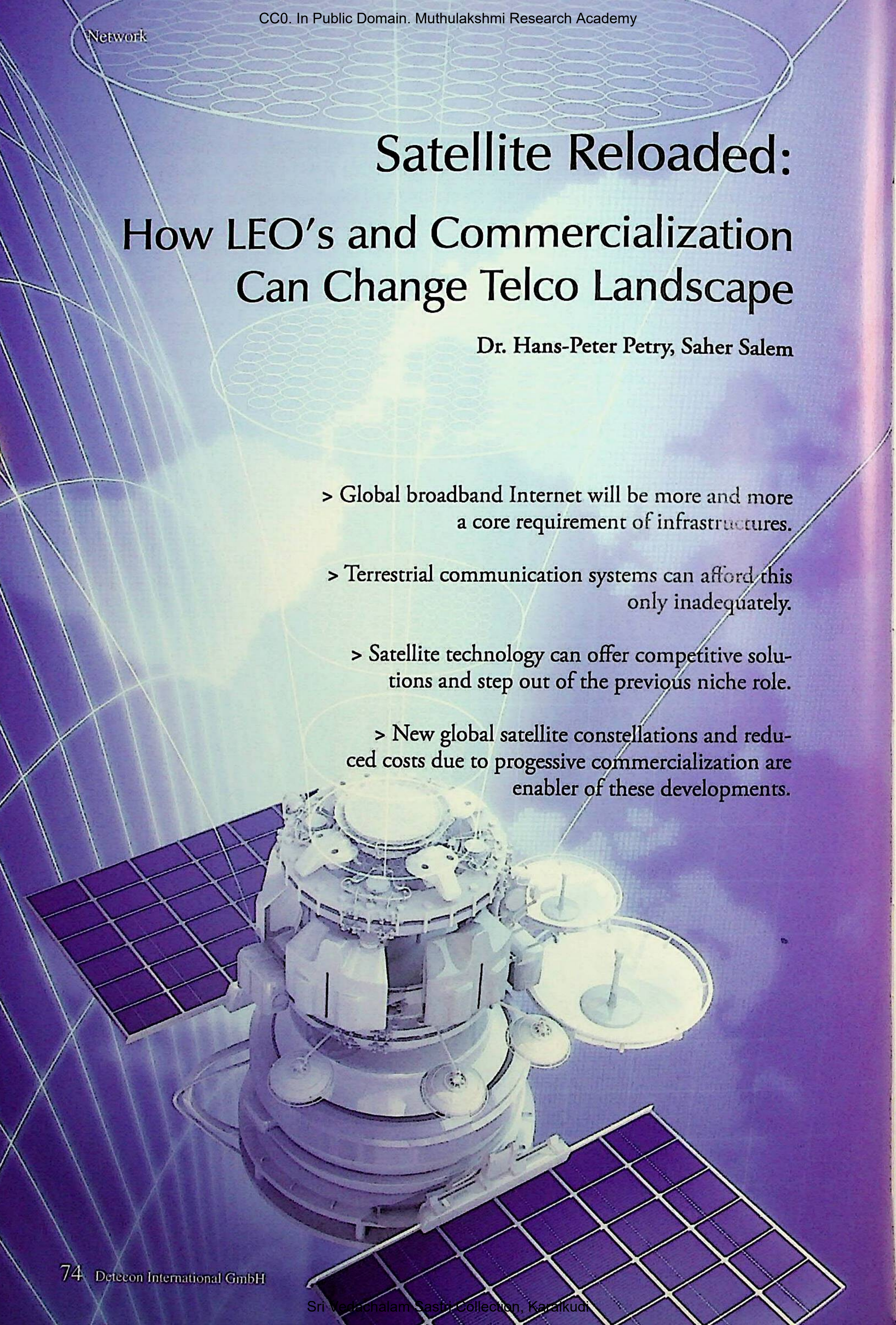

Satellite Reloaded:

How LEO's and Commercialization Can Change Telco Landscape

Dr. Hans-Peter Petry, Saher Salem

> Global broadband Internet will be more and more a core requirement of infrastructures.

> Terrestrial communication systems can afford this only inadequately.

> Satellite technology can offer competitive solutions and step out of the previous niche role.

> New global satellite constellations and reduced costs due to progessive commercialization are enabler of these developments.

During the CES (Consumer Electronics Show) in Las Vegas, one of the benchmarks for current developments in consumption and communications societies, booths for drones and autonomous driving were by far the most visited. They also presented the highest growth in occupied space for the year 2016.

New challenges for the telecommunications industry

In fact, CES gave the impression of being the first automobile exhibition rather than a big electronic show. Each and every car manufacturer was available over there illustrating state-of-the-art projects of all kinds. However, this year's show wasn't about newly designed car bodies or innovations in motor power as it used to be in the past. Even new ideas for sustainable and environmental-friendly solutions weren't on the high priority. Top priority was to express how deep every car manufacturer is thinking about the megabytes and gigabytes of the future and how to build up a high-tech vehicle. Connecting different car components together internally and the car itself with mobile communications infrastructure externally, the so-called Connected Car, open numerous interesting perspectives. Applications and use cases range from In-Car permanent broadband internet access to eventually autonomous driving with no human interaction needed. Hence it's no wonder that global players like Google, Apple or Facebook are digging into those future markets. Apple for example is thinking of "Apple Car" as a potential product for such market. On the other hand Google is leading discussions with car manufacturers and suppliers for possible cooperation and ad-hoc business. Idea is not only limited to connect the car with current operators' infrastructure but also to provide a new dedicated infrastructure.

Here come the above mentioned drones into play. The technical advances so far make it possible to provide a remotely controlled, partially autonomous and very low cost flying body for low altitudes. Their use either privately, semi-professional or fully professional unlocks the door for different applications. With the evolution of 3D (optical) perspectives at reduced technical and costs overheads, it's feasible meanwhile to own and operate a drone as long as regulations are maintained. Video applications represent an important use case beside the entertainment factor. What applies for optical signal propagation applies also with few limitations to electromagnetic waves at low frequency. Thus it's completely reasonable to consider drones as a possible provider of flexible communications infrastructure. That even explains why Google for example is working vigorously on possible solutions.[1]

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[1] *Cf. Reuters et. al.: Google's Planning To Deliver Super-Fast 5G Internet From Solar-Powered Drones, Codename: SkyBender.*

With the high interest of car manufacturers in 5G, there exists a possible competition with the future terrestrial network. Certainly the radio coverage from a transceiver at a certain height is much better than that of a transceiver near the ground and for safe-of-life applications that would be of great importance.

Classical mobile network operators are still playing the observer role. They still focus their investments in enhancing the already built up terrestrial mobile network. Bandwidth and capacity, a major problem of last years, are significantly increasing through 4G/5G and will satisfy future needs for high bandwidth.[2]

Yet coverage is and will remain a problem: the degree of terrestrial mobile network coverage can increase, however only in conjunction with a huge costs rise. Thus some white spots will remain and with regard to safety-of-life applications for sure it's intolerable.

"Internet from the sky" is an interesting thinking approach which can be taken seriously. The idea itself is not newly born bit but never came to mature stage. Past initiatives which didn't progress, strict regulations and the weak economic benefit were behind.

New chances for satellite communications

What is then the role of satellite? The answer is simple; the step from drones to satellites is consequent especially when considering Low Earth Orbit (LEO) satellites. Nowadays most satellite communications rely mainly on Geostationary Orbit Satellites (GEOs). A well-know application is the TV broadcast that is widely spread all over the globe. This application will also remain sustainable in the future as modern satellite technology satisfies HDTV and 4K-TV bandwidth requirements. However bidirectional mobile communications still represent a niche as GEO satellite hold some technical challenges for this specific application. Among these are the link budget for uplink (device towards satellite) and the long propagation delay. Furthermore satellite projects are long running, expensive and strongly dependant on satellite operators. These factors are prohibitive for the rapidly changing mobile communications.

Satellite navigation, as a use case, expresses the global coverage of satellites. Each and every one of us uses Global Positioning System (GPS) on daily basis, a system that relies mainly of LEOs. None of the modern mobile phone is thought to be without GPS i.e. Apps or Google maps. The good coverage mentioned above can be confirmed by any simple car navigation device. Apart from tunnels and some certain places, usually between nine to twelve satellites are visible at any spot. Therefore the coverage is much better when compared to a car phone for example.

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[2] *Cf. Petry, Future Broadband Communication Between Wishful Thinking and Reality, in: Future Telco, Profitability in Telecommunications, Seven Levers Securing the Future, Detecon Publikation 2014, p. 80-95; Krah/Eckstein, How Small Cells Become a Success Story for Operators, in: Future Telco Reloaded, Detecon Publikation 2015, p. 90-99.*

Based on such system principles there are still a couple of issues to be resolved for future satellite based communication systems. First problem is the availability of high bandwidth and cell capacity. However, this problem is also available in terrestrial mobile networks and in fact it isn't of a hurdle. Just the contrary: there is a much higher probability for a direct line-of-sight (LOS) when using satellite-based communications meaning that additional high frequency bands (Ka-Band, Ku-Band and mmWave) can be leveraged. There, relative bandwidths are much higher than at frequencies below 5 GHz. That is a fact which 5G standard will make use of despite the limitations in terrestrial mobile networks because of lower chances for LOS. Moreover by considering extra costs and rollout plans of terrestrial networks, the chances for satellite systems increase dramatically. Those aspects have been observed from different players. Currently there is a commercialization trend taking place in the aerospace industry which we'll have a look at it over here.

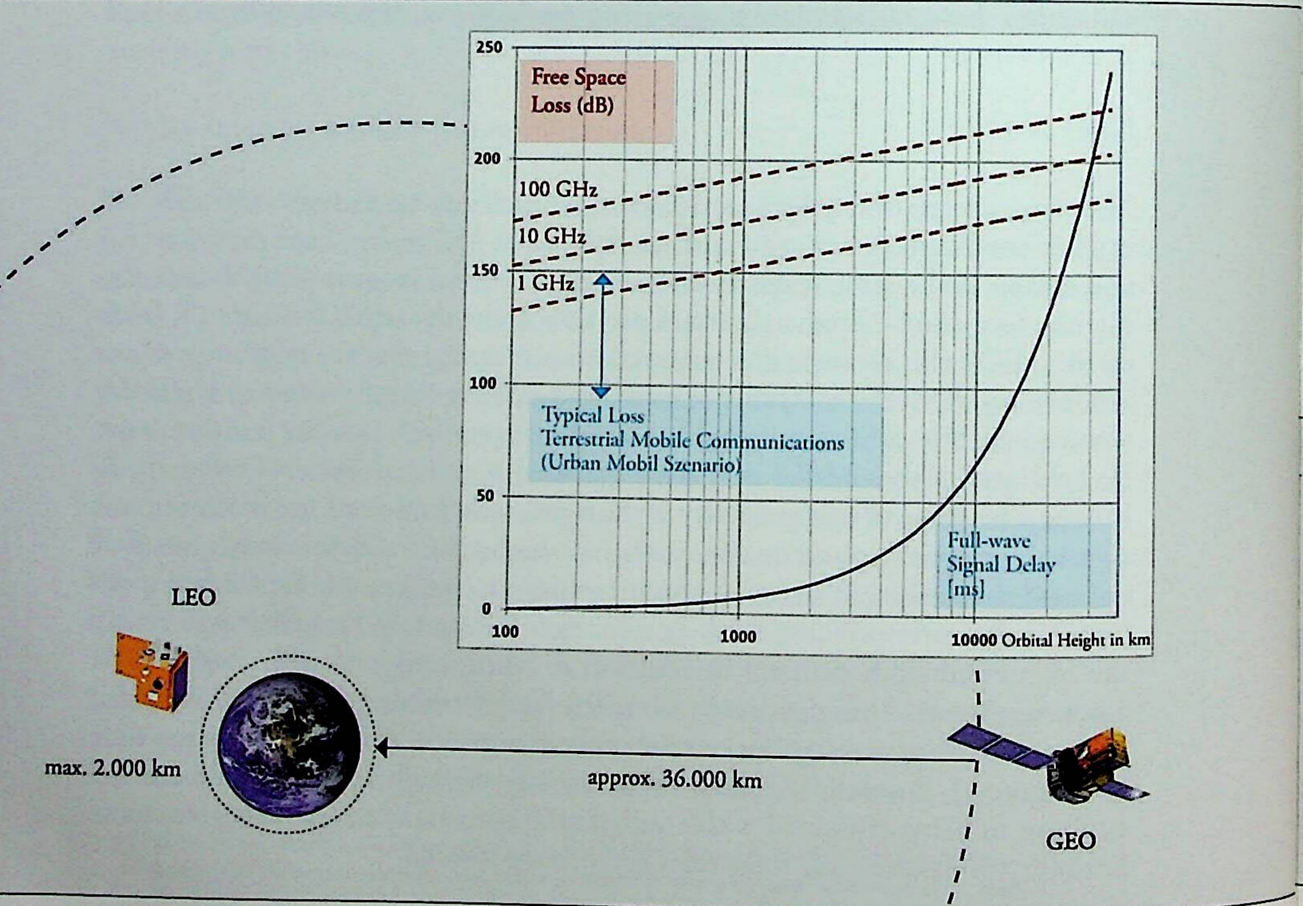
GEO and LEO

The classical type of satellites used for communications nowadays is the GEO. It is positioned at a certain orbit with an altitude of 35,786 km from earth surface and rotates at the same speed as earth rotation around its own pivot. Hence the satellite seems to be fixed at a certain position in the sky when looking at it from earth. GEO's also rotate in an equatorial orbit meaning that the satellite position is above equator. The footprint of one GEO satellite therefore doesn't cover the whole globe but rather a geographical width of up to 60°. Satellite position must be held accurately and for that there exists some control systems onboard. A unique advantage of this geometry is the a-priori definition of the footprint and no need for a moving antenna on earth. Also high gain antennas can be mounted onboard the satellite as well as at ground stations to compensate for the free space loss and the corresponding weak link budget. Future GEO satellites will satisfy the high bandwidth demand in addition to being equipped with configurable antenna systems. This gives more flexibility in determining footprints and orbit positions. A disadavantage for certain applications is the signal propogation time (see Figure 1). Future GEO satellites will satisfy the high bandwidth demand in addition to being equipped with configurable antenna systems. This gives more flexibility in determining footprints and orbit positions.

LEO satellites rotate in much lower orbits with no fixed radius, typically in a range of 100 to 2000 km. Since LEO satellites do rotate much faster than earth rotation, they are only visible for a relatively short time leading to a constellation of many LEO satellites (see Figure 2).

Here synchronization of rotation timing and distance between satellites is definitely required to achieve the desired satellite network. Handover between satellites is further needed for communication scenarios exactly as the case of terrestrial mobile networks. System capacity can always be enhanced by the number of satellites same as small cells for terrestrial mobile networks. Due to the continuous dynamics of LEO satellites, it's difficult to realize high gain antenna onboard the satellites. Nevertheless because of the low altitude, free space loss is low and no need for such antennas. In fact free space loss for frequencies below 10 GHz is similar to that of terrestrial mobile network at cell edge with no LOS.

Figure 1: Comparison GEO – LEO, System Parameters, Free Space Loss and Term



Source: Detecon

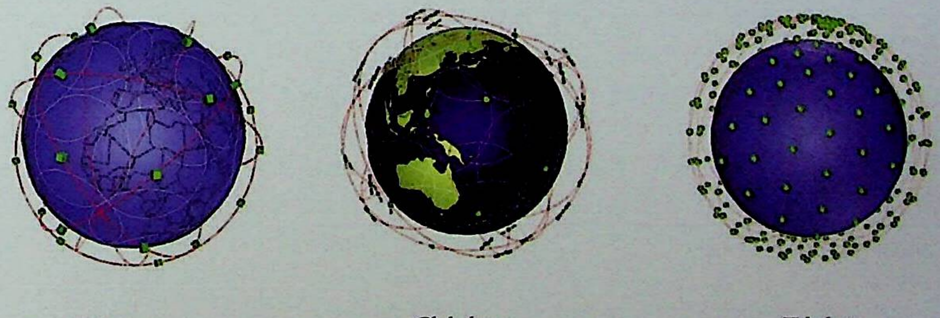
The technical complexity (transmit power, noise figures or antenna gain) either at satellite or terminal side is similar to that of terrestrial networks. LEO satellites are also expecting an evolution in the mobile receivers for various broadband applications. The use of high frequency bands (>10 GHz) is still challenging for system balance. The use of high-performance antennas with automatic beam forming is therefore essential.

GEOs and LEOs rotate in circular orbits. On top of that, there are geometries with elliptical orbits (HEO: High Elliptical Orbit). Due to the large variation of geometry parameters such orbits are not well suited for the applications discussed here.

Commercialization of Aerospace

A lot of progress has taken place in the aerospace industry and in the field of satellite communications from a technical perspective, yet the development process remains the same. Satellites are usually individual pieces, which are ordered by certain organizations and are built up by specialized manufacturers. The required reliability, particularly for geostationary orbit, necessitates complex and long-running qualification processes that are by nature very expensive and extended over several years. The loss of a satellite during launch, positioning in orbit or complete malfunction can shut down an entire program and devour immense sums of money. Such barriers have stopped many countries from investing into their own satellite infrastructure.

Figure 2: Example of LEO Constellations



Orbcomm

Globalstar

Teledesic

Source: NTA

Currently a turnaround is observed over here and one can confidently speak of a paradigm shift. It began with the end of the US shuttle program and the increasing dependence on the outdated but indeed mature Russian technology of Sojus. Since 2010 Tesla CEO Elon Musk and Amazon CEO Jeff Bezos, whom were followed by a bunch of players, positioned themselves as forerunners to a new generation of commercial suppliers of launchers and satellites. Conventional concepts are thrown overboard, everything is first put into question and more risks are to be accepted. According to Silicon Valley mentality, possibility of failure belongs to the program. Despite all the prophecies of doom, this approach seems to lead to success. Just think of the first successful attempts to reuse a Falcon 9 rocket in December, 2015.

Nevertheless, there are still huge investment volumes and business risk to stem. The investment of the above-mentioned players is taken from previous business ideas and their successful implementation. It can be clearly seen that the satellite is mainly considered to make other promising businesses independent of third party's infrastructure: future car and telecommunications are closely

Table: Comparison GEO – LEO, System parameters

	LEO	GEO
Technical Parameters:		
• Orbital height	100 – 2000 [km]	35.768 [km]
• Orbital period	<2 [h]	24 [h]
• Visibility	10 – 20 [min]	24 [h]
• Transmission power (satellite)	Low	High – very high
• Transmission power (ground station)	Low	High
• Antenna gain (satellite)	Low – medium	High – very high
• Antenna gain (ground station)	Low – medium	Medium
• Signal Propagation time (round trip)	< 13 [ms]	250 [ms]
• Doppler shift	Yes	No
• Weight	Low	High
Operation parameters:		
• Reliability	Low – medium	Very high
• Satellite lifetime	medium (2 – 3 years)	Hoch (5 – 7+ Jahre)
• Number of satellites	High	1 + 1 (Redundanz)
• Handover	Yes	No
• Multiple launch	Yes	Max. 2 – 3
Commercial parameters:		
• Satellite costs	Low	Very high
• System costs	Moderate	High
• System complexity	High	Moderate

Source: Detecon

related. The automobile industry is just the first step towards a fully digitized future production world (M2M, I 4.0).

How can commercialization help satellite programs, particularly the ones for satellite communications, be cheaper and faster growing? Here are a number of promising approaches: new players have adopted a new way of thinking and do not suffer from established and partly encrusted patterns and processes anymore. Financial resources (also from the venture capital environment) are there with no need for national and/or international institutions' funding. Political interests are not into play. Despite all concerns of classical players, numerous possibilities of technology reuse from other areas are open. Starting from scratch every time a satellite is launched can be sacrificed. Proprietary technology belongs to the past, open standards and modularity are available, a principle that has terrestrial communications industry has long understood. In synergy with the terrestrial communications enormous opportunities do exist through the use of successfully established or future technologies (4G / 5G).

The most important role in the future will be played by LEO satellites. LEOs can be built in a much simpler and quicker way than high altitude (GEO) satellites (Figure 3).

It's also the case as in terrestrial communications during the transition from macro to micro cells (Small Cells): costs sink more sharply as the number of satellites increases. LEOs can be produced on an assembly line with high modularity and with one rocket start a large number of satellites can be brought to the (LEO) orbit. The planning, design and even construction no longer require overcoming a variety of obstacles as it was before.

New system approaches

Out of these promising approaches one can now consider new scenarios that can lift the importance of satellite technology to higher levels. Back to the early mentioned drones, they fly at levels that are also used by the civil and military aviation. In fact they are airplanes and not satellites. As a possible powerful communication infrastructure they ought to be of course different from the „toys" used for entertainment these days. A typical example is Google's approach of giant drone (Project SkyBender, Figure 4).

What looks like a model airplane in the picture is an aircraft at the size of a jumbo jet. That's essential to generate the necessary energy for continuous operation using solar cells. Google has already tested a number of similar approaches in the past, including the so-called HAP (High Altitude Platforms). The corresponding project was called „Loom" and is based on flying balloons. In both cases, the target is to rely on the latest transmission technology of mobile communication standards (4G/5G). Especially 5G research moves in the direction of using higher microwave frequencies (mmWave), which can significantly provide higher capacities due to their high transmission bandwidth than traditional cellular frequencies. For terrestrial broadcasting those frequency bands are only suitable if you have optical sight. Regarding high-flying „base stations" it is much less of a problem, thanks to the possibility for LOS. High flying drones and HAP do have to consider interoperability with aviation industry (space sharing) which is tied to lengthy regulatory processes.

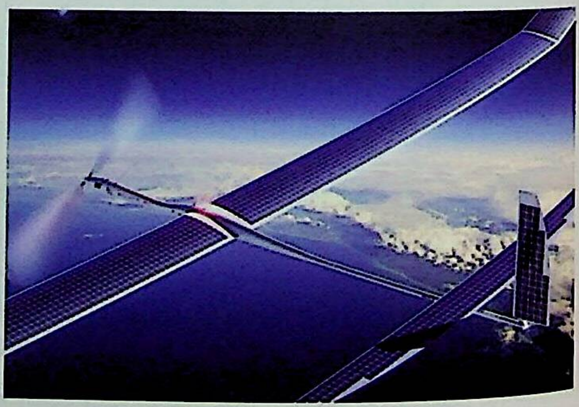
These problems are not seen in case of LEOs. The range of LEO orbits for a reasonable satellite lifetime isn't completely usable because of the inner Van Allen radiation belt (high-energy protons in the range 700-6000 km from equator). Yet enough space is still available. Low orbits are favorable for small link budget and signal propagation time. Another open topic is the space debris. LEO orbits belong to those orbits overloaded with space debris. Hence appropriate rules have been set with which the designs must be compatible.[3]

The basic building block is thus a LEO constellation of small to medium-sized satellites brought into orbit over several launches. The commercialization and compactness can reduce costs significantly compared to the traditional solution.

Figure 3:
NASA Cube Sat (Phonesat)

Source: NASA

Figure 4:
Google Drone (Project SkyBender) – Artists View



Source: Google

The number of satellites will strongly depend on the targeted application, and - as a rule of thumb – it lies between a few hundreds and few thousands. Here the real challenges begin.

A first step in this direction is the cooperation of the American company OneWeb (founder Greg Wyler, formerly Google) with Airbus and Virgin Galactic (Richard Branson). Virgin Galactic and the US chip manufacturer Qualcomm sponsor the company to a great extent. OneWeb constellation (Figure 5) is to start with 600-700 satellites with additional 300 satellites as a reserve. Scheduled first start (launch) is 2018.

The satellites weigh „only“ 150 Kg and cost „only“ half a million dollars. Orbit height is planned to be around 1200 km. Terminals which are relatively large and sophisticated need to be further compromised. This is also related to Ku-band frequencies (11 - 14 results GHz) as they are still unsuitable for a small and powerful terminal. Consequently, the project is primarily aimed at the broadband global (but fixed) Internet access, by which the terminal can then be used as a hotspot for local wireless internet access and/or 4G / 5G air interfaces. This is certainly a solution to complement terrestrial mobile coverage in areas where it is uneconomical.

Despite all the innovation, oneWeb planned system is still a conventional approach: use of satellite technology as a supplement or backup for terrestrial systems. The question is whether innovation can go beyond the conventional approach: LEO constellations with far more satellites that are still significantly smaller and therefore less expensive. Coordination and networking of mini satellites with each other is essential and probably one of the biggest problems. The „swarm“ of small and micro objects requires highly intelligent synchronization methodology as well as communication processes (self-organization, a topic in terrestrial microcell networks.[4] A possible solution can be inherited from nature such as birds or fish swarms. The research is active here with interesting solutions expected. A global standardization (like terrestrial mobile) can open up a whole new world and allows for different business models to new players with less entry barriers. This development is driven by a range of new applications that are currently being marketed heavily, but for which there is still no coherent technical solution.

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[3] *Cf. Space Debris Mitigation Guidelines, United Nations Office for Outer Space Affairs, Vienna, 2010, IADC Space Debris Mitigation Guidelies, Inter Agency Space Debris Coordination Committee, September 2007.*

[4] *Cf. Petry, Future Broadband Communication Between Wishful Thinking and Reality in: Future Telco – Profitability in the Telecommunications Industry: Seven Levers Securing the Future, 2014, p. 80 ff.*

New use cases

These thoughts lead us back to the CES in Las Vegas and the autonomous driving.[5] Despite all the marketing hype, it's still a long way to go. Current concepts speak of partial automation. This is not surprising, as by far the information for the vehicle comes from its local sensor and its immediate surroundings. Adaptive cruise control and lane-keeping assistant have been around for quite a while. But even this level of development requires a good quality local infrastructure so that sensors can provide clear signals. However to make the dream of fully autonomous driving real, experts agree on the need for powerful global infrastructure that allows for global and mobile communications converging with traffic management. Safety requirements also require broadband, very low latency and really 100% coverage without the frequently-discussed „white spots". Moreover, this applies not only on the possible autonomous driving of the future, but is also expandable to the promising new world of M2M communications. 4G/5G networks with global coverage could solve this problem – as expected. The question is will a global coverage be really there? If so, when and at what cost? Here the potential for future satellite technology is high. A global terrestrial coverage isn't a clever investment in areas with low population density. In addition, there are other areas and applications, which could be addressed via the global satellite network described above. Just think of the air traffic control in areas without radar coverage.

The satellite technology of the future here can play a far more important role than in the past, not only as a complement rather than an enabler of future opportunities. The classical terrestrial network operators should be aware of these opportunities and change their observer role in a more active role.

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[5] *Cf. Prof. Dr. Karsten Lemmer, DLR, Einführungsvortrag „Autonomes Fahren", Acatech, Deutsche Akademie der Technikwissenschaften, Akademietag 2014.*

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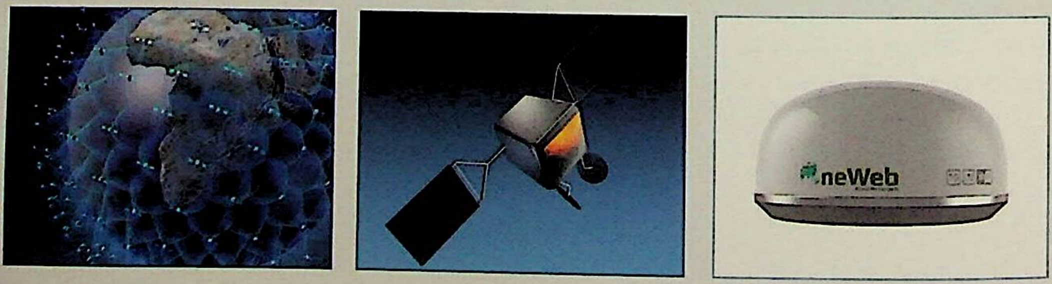
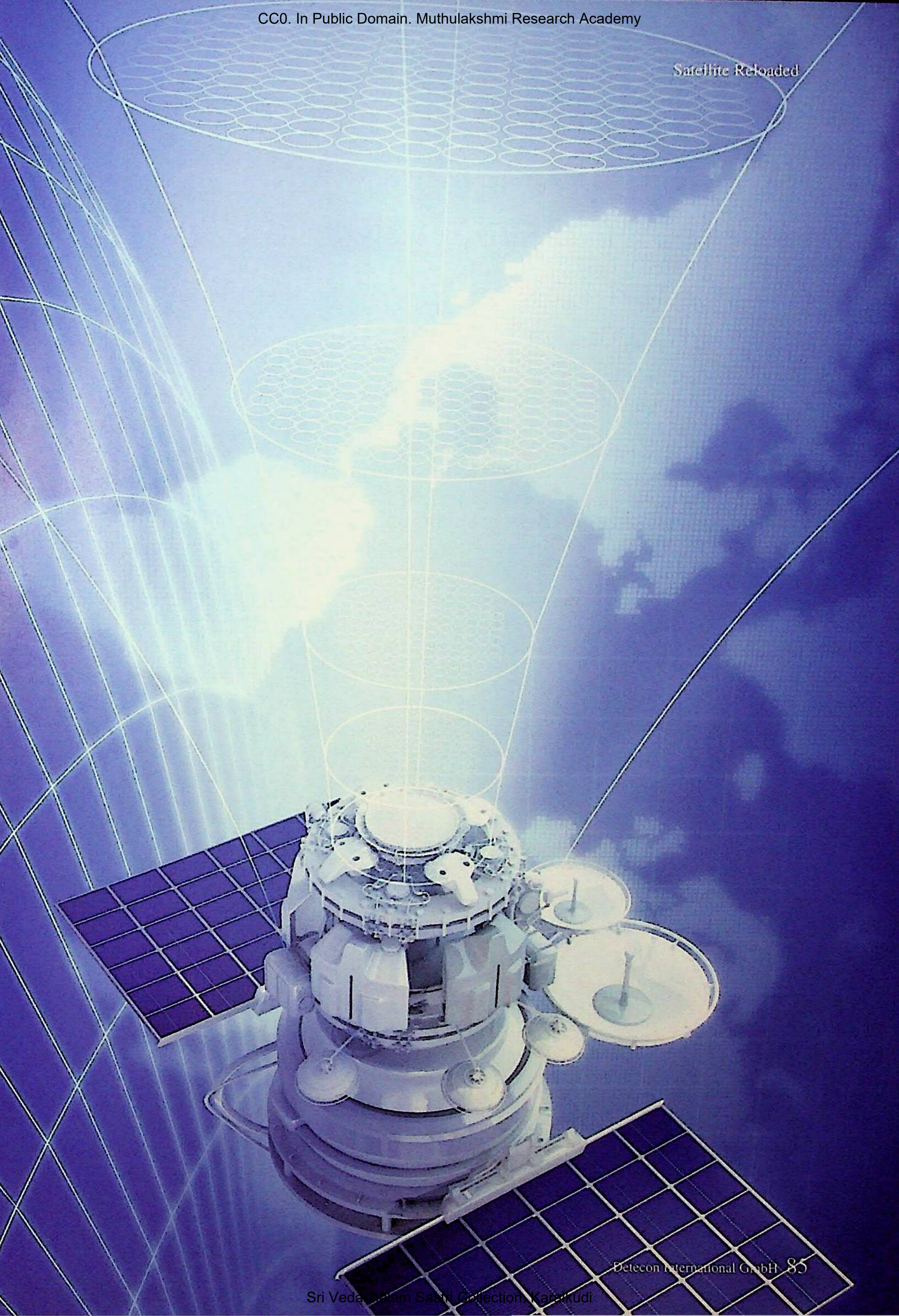
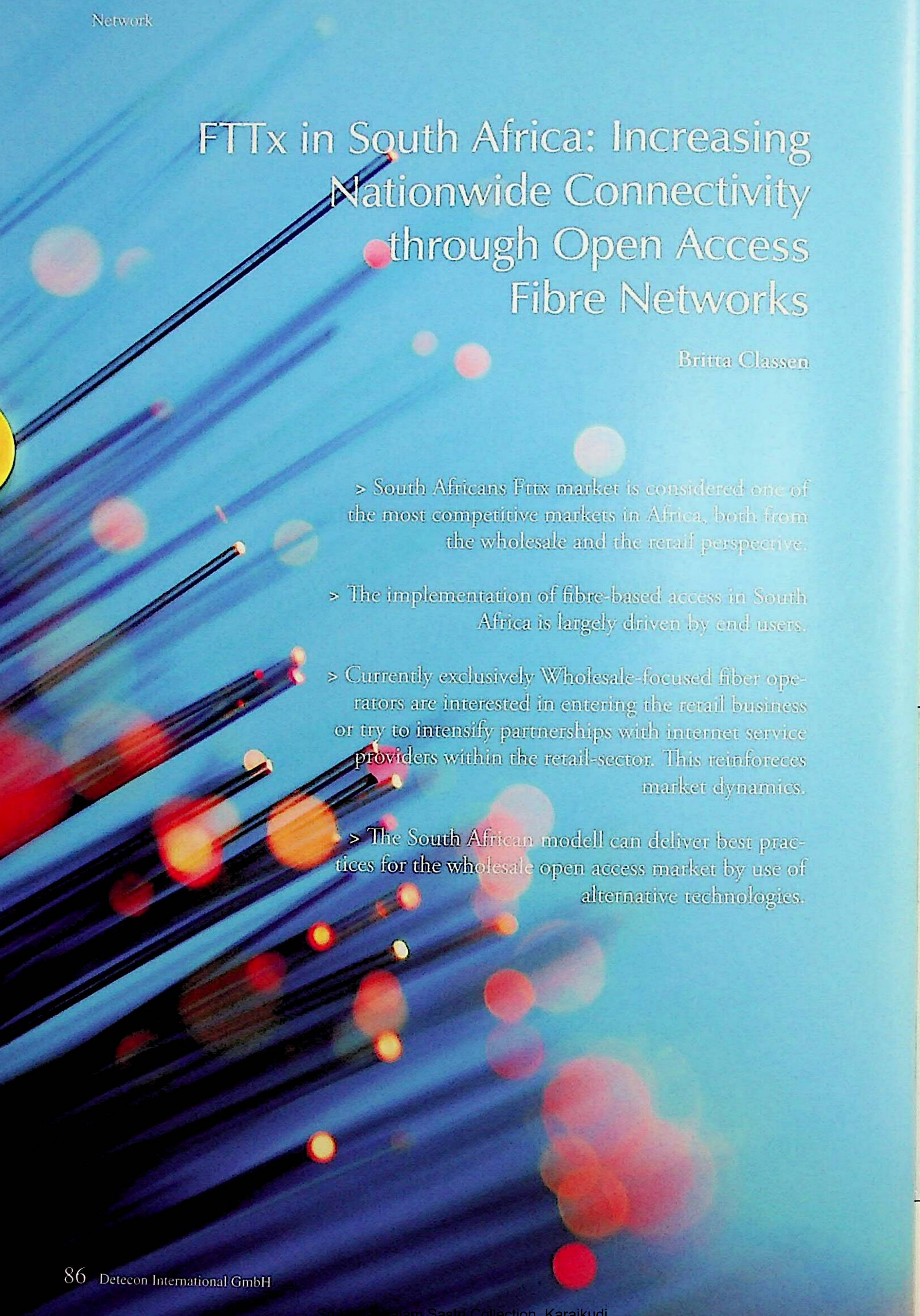
Figure 5: The OneWeb-Constellation



OneWeb Constellation **OneWeb LEO** **OneWeb Terminal**

Source: Internet





FTTx in South Africa: Increasing Nationwide Connectivity through Open Access Fibre Networks

Britta Classen

> South Africans Fttx market is considered one of the most competitive markets in Africa, both from the wholesale and the retail perspective.

> The implementation of fibre-based access in South Africa is largely driven by end users.

> Currently exclusively Wholesale-focused fiber operators are interested in entering the retail business or try to intensify partnerships with internet service providers within the retail-sector. This reinforeces market dynamics.

> The South African modell can deliver best practices for the wholesale open access market by use of alternative technologies.

The global telecommunications and ICT market is developing at a fast pace. There is a constant surplus of demand for advanced telecommunication services. New technologies and applications and information/IT-based business models have led to a significant increase in data volumes during the past years.

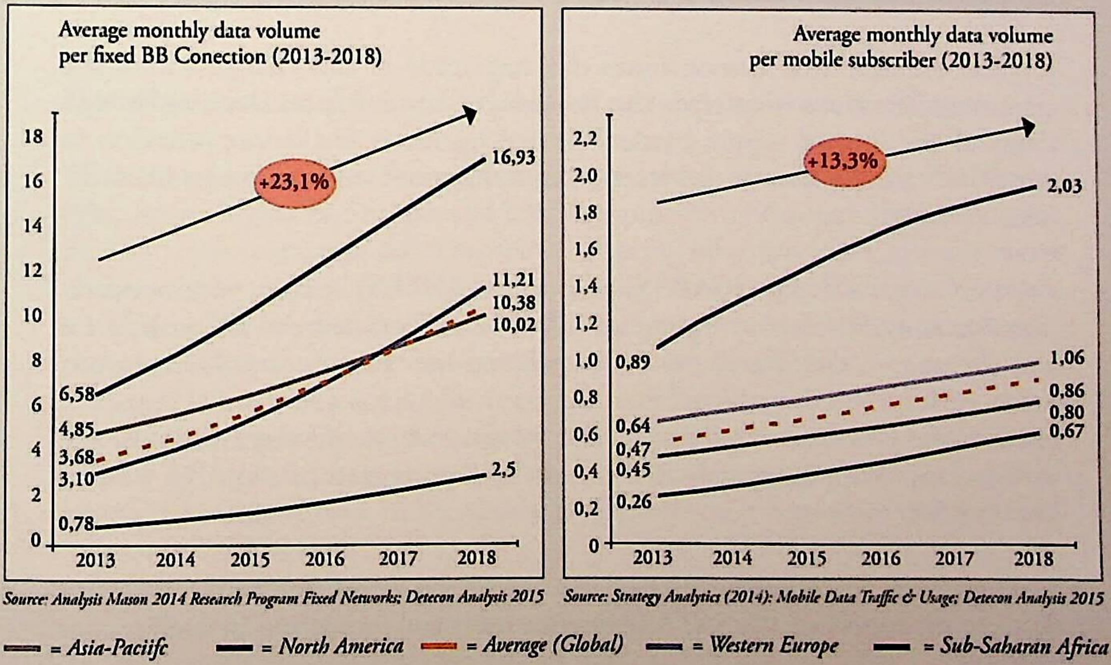
Fibre-based access can cover the increasing demand for bandwidth

Causing in turn an expected growth of the average monthly data volume per fixed BB connection of +23.1% (CAGR 2013-2018) as well as a CAGR of +13.2% on the average monthly mobile data volume per subscriber (see Figure 1).

The information society of the future will be based on ubiquitous fixed and wireless access to data, available at ever increasing speeds. Fibre based access is the access technology of the future, as no other competitive terrestrial technology is in sight that is able to cope with the expected demand for bandwidth.

As the demand for data is growing, the African continent is still lagging behind in terms of telco infrastructure deployment (FTTx penetration, LTE penetration) compared to other regions. Over the past years, most African countries have leapfrogged the development of a reliable nationwide fixed network infrastructure,

Figure 1: Average Monthly Data Volume for Fixed and Mobile BB for Selected Regions



Source: Analysis Mason 2014 Research Program Fixed Networks; Detecon Analysis 2015

Source: Strategy Analytics (2014): Mobile Data Traffic & Usage; Detecon Analysis 2015

Source: Detecon

moving straight on to mobile voice and, consecutively, mobile broadband. The fixed line market and its infrastructure developments, which, de facto, are also needed for mobile backhauling purposes, have been neglected.

South African telecommunications market with special features

In addition, many African telecommunications markets have seen only limited competition in the last decades and prices for telecommunications services have therefore remained at a high level compared to other parts of the world. Regulatory mechanisms such as Local Loop Unbundling (LLU) have not (yet) been implemented in many countries and incumbent operators have had no need or incentive to deliver services following market demand. Instead, often poorly performing fixed network incumbents have been able to determine their network strategies and roll out planning (e.g. for FTTx) independently and without the need to satisfy market requirements as alternatives were not available.

As a result of these constrained market conditions, a significant number of small and lean fibre deployment companies, so-called “fibrecos”, have surfaced during recent years. These companies are increasingly competing with incumbents for retail customers, particularly in high-value urban areas. At the same time, wholesale infrastructure providers are setting up operations across Africa and are contributing to the establishment of open access wholesale business models on their fibre infrastructure.

A good example that demonstrates the magnitude of this change within the telecommunications industry is the Republic of South Africa. Despite the high demand and limited supply, barriers for new operators and service providers to enter the South African market for telecommunications services have traditionally been very high:

> High costs to deploy (CAPEX) and operate (OPEX) a nationwide network. This is mainly driven by the geographical size and characteristics of South Africa and the uneven distribution of the population over the country. For example, South Africa is 3.4 times bigger than Germany, which has a substantial impact in terms of the provision of geographical coverage. Further, the population density in Germany is approximately 234 people/km2 compared to about 50 people/km^2 in RSA;

> High costs to connect Africa to the rest of the world due to the longterm de-facto monopoly on the SAT3 submarine cable and limitations in satellite connections.

Over the last years, the market has seen a number of private sector investments break the state-owned incumbent's de-facto monopoly on the national long distance and international services. These are:

> MTN, Vodacom, SANRAL and Neotel are jointly building 5,000 km of fibre along major routes (e.g. Johannesburg – Durban, Johannesburg – Cape Town).

> Neotel, the country's second fixed line operator is building fibre links across the country.

> Dark Fibre Africa (subsidiary of Community Investment Ventures) has implemented a long haul fibre optic network and expansion of network coverage is still in progress.

> Two additional sub-marine cables, EASSy and WACS, were commissioned into service in 2010 and 2012. As of today, all incumbent operators in South Africa have equal access to capacity on these cables by direct connection at the landing stations.

The South African telco market is currently composed of more than 180 active licensed Internet Service Providers. With such a high number of players in the market it becomes clear that time to market is a crucial success factor for every market player.

Use of open access infrastructure based on personal initiative of end users

With the success of the first market movers as well as a strong market driven demand for higher bandwidth and reliable connectivity through fibre, the competition in the market has also increased. This not only drives the roll-out speed to connect homes and premises but also brings down costs. At the same time, more attractive bundled 2x, 3x and 4x play offerings are becoming available that provide increased value for money and, in turn, drive data usage.

The current conditions in the country are extremely favourable for investment because of high demand from end users who are, uniquely to South Africa, taking the initiative and responsibility to petition their respective communities to become FTTH ready.[1]

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[1] *Cf. Juanita Clark, CEO FTTH Council Africa, Interview Oktober 2015.*

South Africa is unique in this sense as the housing is very much organized in closed communities and estates. In the case of FTTH deployment, this actually can work in favour of the industry. Well-organized Home Owners Associations (HOAs) are driving the market education and stimulation, setting up FTTH 'readiness' initiatives and educating their communities on the benefits of FTTH. While these HOAs are writing and adjudicating FTTH tenders for the roll-out of open access infrastructure, they are taking the lead and are arranging workshops and meetings, ensuring that residents' expectations are managed. In addition, HOAs are appointing FTTH champions that take responsibility for ensuring a guaranteed minimum of 40% uptake rate to make their communities attractive.

The South African model could become an interesting showcase for other countries with similar residential housing styles (i.e. Mexico, Philippines, etc.) as it demonstrates how a nationwide connectivity gap can be bridged through the usage of open access network deployment.

In 2015, the local fibre industry has developed a "gold-rush-mentality". Fibre companies describe the current market situation as a "land-grab": The first company rolling out fibre infrastructure in a certain area literally owns this portion of the market with all its customers. The market is currently over-stimulated, leading to a situation where market operators are cherry picking communities that can provide the required ROI.[2]

Sketching the market development

The implementation of open-access fibre-optic networks in South Africa is without a doubt on the rise, impacted by drivers such as government policy, end user demand and the need to roll out as cost effectively as possible (see Figure 2). The increasing number of open access fibre networks will drive infrastructure based competition, ultimately bringing down network prices, which will then further stimulate the demand for fibre access through better affordability, leading to an even bigger demand for nationwide fibre roll-outs.

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[2] *Cf. Juanita Clark, CEO FTTH Council Africa, Interview Oktober 2015.*

The over-stimulation and high demand will impact fibre roll-out pricing in the short term. Due to an under-supply of resources for civil works and skilled construction capacity for fibre roll-outs, prices are expected to increase. However, in the medium term (2018+) more construction capacity is expected to come to market and prices will once again fall.[3]

With the success of the first market movers as well as a strong market-driven demand for higher bandwidth and reliable connectivity through fibre, the competition in the market has also intensified. Fibrecos increasingly differentiate their offerings to move up the wholesale value chain and strive for higher revenue generation. This has caused the market to become increasingly crowded in the retail sphere, making the move up the value chain inevitable, but still no guarantee for business model success (see Figure 3).

The market shows increasing demand for integrated offerings which, together with general economies of scale and scope, lets us conclude that the existing strong fragmentation of the fibre market with many different smaller players will be temporary.

Figure 2: Open Access Network Drivers

Fairer Competition	**Government**	**End-User**	**Cloud Computing**	**Cost Savings**
Smaller operators wanting to gain acces to infrastructure and markets at fair and equitable terms in order to build up market share,	Governments aiming to improve ICT penetration in order to stimulate growth and improve utilization of state resources.	The end-user demanding more dynamic services, cheaper access to faster bandwidth at a higher quality of service.	To leverage benefits of cloud computing (cost saving, business agility, etc.), many organisations seek fast and secure fibre conectivity.	Operators aiming to lower NW TCO look for ways to separate infrastucture from NW services to focus on the core of their business models.

Source: Detecon

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[3] *Cf. Craig Carthy, Führungskraft bei Link Africa (Glasfaser-Infrastrukturanbieter in Südafrika): Interview Oktober 2015.*

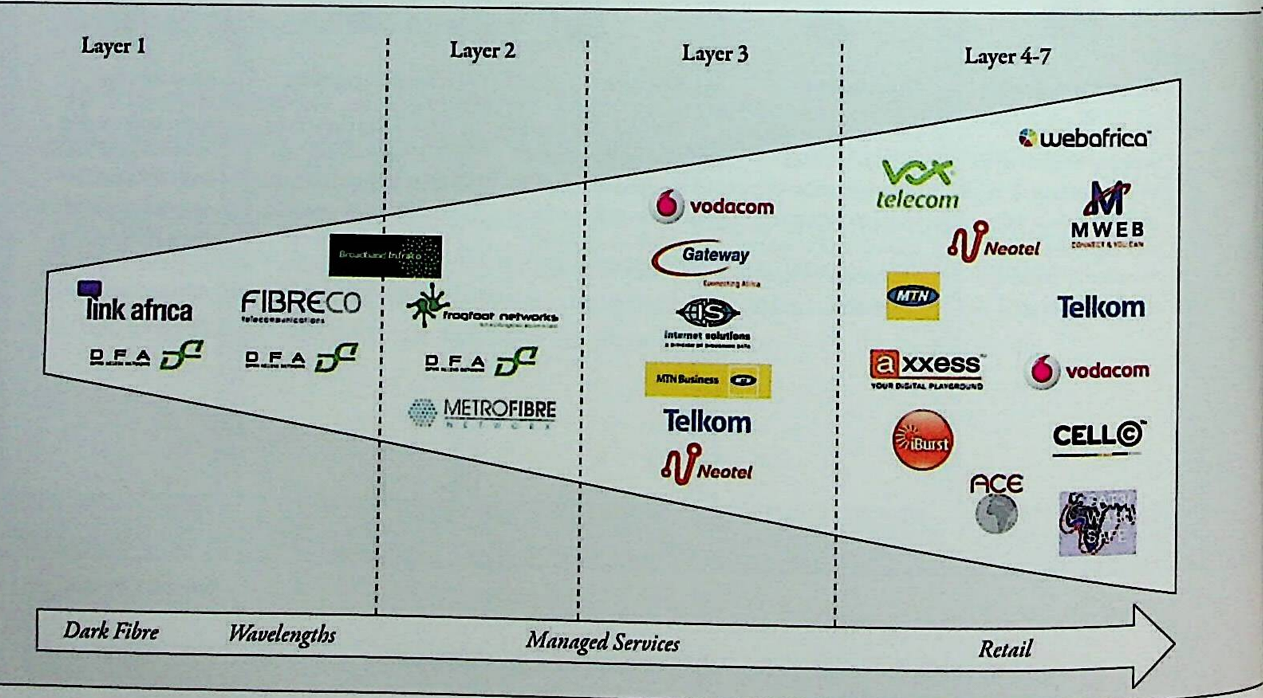
Fibre operators that are currently no threat to the incumbent operators are likely to increase their footprints, reach a more significant size and therewith gain a more powerful position in the market in the short to midterm. Joint ventures as well as service and network-based cooperations and partnerships between two small players as well as big telcos partnering with a small fibreco indicate potential for substantial consolidation in the mid-term (see Figure 3).

Examples of market consolidation

Two prominent examples for market consolidation in South Africa already exist:

MTN and Smart Village: Smart Village started its operations in South Africa in 2004 as multi-play service provider owned by MultiChoice. The company currently owns a fibre network that passes 29,000 residential homes in the three major provinces of the country: Gauteng, the Western Cape and Kwazulu Natal. Smart Village claims to have a customer base of more than 6,000 connected homes and businesses which they are able to provide with converged multi-media and telco service solutions via a single access point.

Figure 3: RSA Telco Market Players and Value Chain


Layer 1
Layer 2
Layer 3
Layer 4-7
link africa
DFA
FIBRECO
DFA
Broadband Infraco
frogfoot networks
DFA
METROFIBRE NETWORX
vodacom
Gateway
Internet solutions
MTN Business
Telkom
Neotel
webafrica
VOX telecom
MWEB
Neotel
MTN
Telkom
axxess
vodacom
iBurst
CELL C
ACE
Dark Fibre
Wavelengths
Managed Services
Retail

Source: Detecon

South Africa's second largest mobile network operator MTN acquired Smart Village in September 2015 to accelerate its fibre-to-the-home strategy for South Africa, gain a stronger footprint in the fixed line market and to enable 4-play-offerings. The acquisition will give MTN presence in more gated estates and apartment blocks, business parks, and shopping malls. In the business market, the deal will give MTN Business the ability to provide wholesale access to 4,228 enterprises passed by Smart Village.

Vox Telecom, Frogfoot and Link Africa: Frogfoot Networks is an ISP which has about 40 staff and a large fibre footprint in Cape Town and has started to roll-out in Johannesburg and Durban to serve both business and home users.

In July 2015, South African Vox Telecom acquired Frogfoot as part of its plan to build its own fibre-optic network to serve business clients in South Africa. The acquisition was driven by the intention to fast-track Vox' fibre strategy by leveraging the existing skills, processes and the installed fibre network of Frogfoot.[4]

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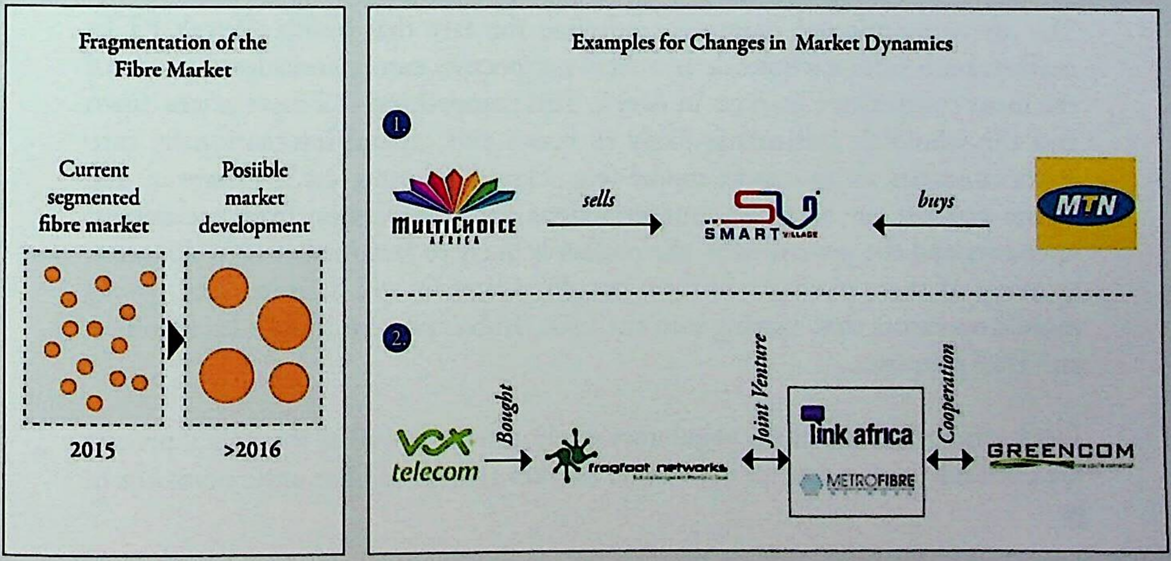
[4] *Cf. Jacques du Toit, CEO bei Vox Telecom, Juli 2014.*

Figure 4: Market Fragmentation


Fragmentation of the Fibre Market
Current segmented fibre market
Posiible market development
2015
>2016
Examples for Changes in Market Dynamics
1.
MULTICHOICE AFRICA
sells
SMART VILLAGE
buys
MTN
2.
vox telecom
Bought
frogfoot networks
Joint Venture
link africa
METROFIBRE
Cooperation
GREENCOM

Source: Detecon

In the newly formed business venture, Frogfoot operates as a separate entity within Vox Telecom's carrier and connectivity division, providing services to the group's customers, in addition to wholesale services to other companies. It will provide fibre on an open-access basis.

Frogfoot's fibre infrastructure is partially built and maintained by Link Africa (LA), a small fibre infrastructure company which bought the South African patents for the FOCUS technology, a proprietary technology for deploying fibre-optic links through municipal sewer systems. Frogfoot and LA signed a Joint Venture agreement mid 2015 for a fibre roll-out in the upmarket residential area of Constantia, where the JV won a tender from the local home owners association (HOA). After completion of the network roll-out, the JV will wholesale the Open Access Network to ISPs.

LinkAfrica and Metrofibre Networx (MFN), a company that deployed and offers CE 2.0 Carrier Class open access fibre network in Gauteng with ultra-high speed and low latency connections, have signed an agreement to co-build, enabling LinkAfrica to build additions to their fiber network using the cost-efficient FOCUS technology.

ISP Greencom has a sales agreement with Metrofibre Networx to re-sell FTTH connectivity to its retail customers, solely utilizing MFN's fibre network.

Best Practices for wholesale open access FTTx market are expected

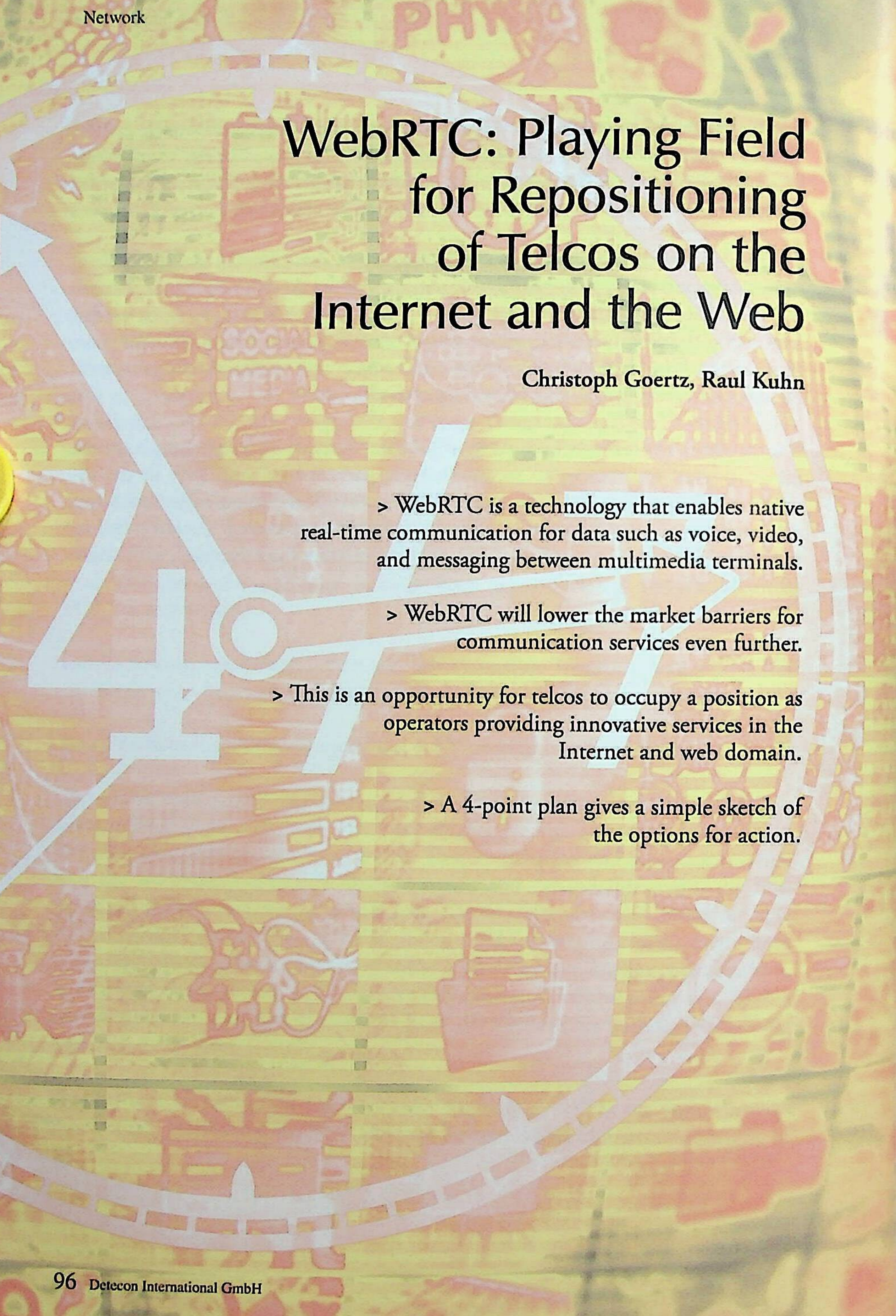
The above mentioned examples underline the fact that South Africa's FTTx market, both from a wholesale and retail perspective, can be considered as one of the most competitive markets in Africa. This competition will drive prices down and the wholesale business is likely to boom and expand internationally into other countries as an export model (e.g. Liquid Telecom, etc.). However, due to the pressure on margins, counter actions and intervention from incumbent operators and the government, the market is likely to face further consolidation, as many of these players will form conglomerates or will be purchased by big mobile operators that moving into the fixed BB business for mobile backhauling and B2B purposes.

Deployment barriers in the regulatory environment as well as the policy process are currently preventing an even faster market growth of fibre optic networks in

South Africa. Additions to the country's telecommunications law, such as the "Rapid Deployment Policy" (Chapter 4, section 21) on processes and procedures for obtaining Right of Way approvals as well as the rights and obligations of telecommunications licensees, are greatly anticipated by the market.

Still, South Africa is an interesting show case to be monitored closely, as it can potentially provide key insights and best practices for the wholesale open access FTTx market through the application of alternative technologies, such as the FOCUS technology, or the development of specific JVs or SPVs for the purpose of reducing fibre deployment costs to a minimum and therewith allowing roll-outs in previously underserviced and unprofitable areas.

The attempts of currently exclusively wholesale-focussed fibre operators to move into the retail business or to secure strategic partnerships with ISPs in the retail domain have the potential to significantly disrupt the market dynamics and achieve what South African citizens and government representatives alike are hoping for: significant growth in fixed BB penetration rates coupled with more affordable access.



WebRTC: Playing Field for Repositioning of Telcos on the Internet and the Web

Christoph Goertz, Raul Kuhn

- WebRTC is a technology that enables native real-time communication for data such as voice, video, and messaging between multimedia terminals.
- WebRTC will lower the market barriers for communication services even further.
- This is an opportunity for telcos to occupy a position as operators providing innovative services in the Internet and web domain.
- A 4-point plan gives a simple sketch of the options for action.

Mobile and fixed network operators all around the globe are going through a technical transformation. The final goal is all-IP transformation, the conversion of the complete infrastructure to Internet protocol (IP). At the services level, the standardized IP multimedia subsystem (IMS) has become established both as PSTN substitution in the fixed network and as a voice solution for voice over LTE (VoLTE). Costs can be reduced significantly thanks to IMS. In terms of new services, IMS is an enabler that makes telco network assets available to developers via standardized interfaces. The new technology of Web real-time communication (WebRTC) can now be used to expand and simplify these interfaces.

WebRTC is a technology, not a solution

WebRTC has been standardized by the World Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF) and defines an application programming interface (API for short) in the web browser that enables native real-time communication for data such as voice, video, and messaging between multimedia terminals. The so-called data channel has been standardized for WebRTC so that data can be transmitted via a direct peer-to-peer connection with the shortest possible latency period. Sensor data from a device, for instance, can be transmitted independently of a video or voice connection. Such uses are especially common for Internet of Things (IoT) applications. Originally developed for peer-to-peer applications from browser to browser, WebRTC has been evolved for integrated utilization in mobile applications. WebRTC speaks the language of web developers, offers them great flexibility, and makes the development of applications relatively simple. Since there is no definition of a signaling protocol for WebRTC, for instance, it is open for various and different solutions and implementations. Possible options for signaling include "SIP over Web Sockets", "XMPP over Web Sockets", "JSON over Web Sockets", REST API, or the data channel.

So-called WebRTC gateways, a kind of bridge between web and telco network, are required to enable WebRTC API communication to VoIP implementations. It can perform a translation to SIP and is capable of recognizing whether a user is reachable via WebRTC or SIP. A gateway must support the following for media handling:

> Audio Codecs G.711 and OPUS
> Video Codecs H.264 and VP8
> Encryption of the media via SRTP
> Media address negotiation via STUN and ICE

The WebRTC gateway also acts as a server that maintains the WebRTC Javascript application for downloading.

WebRTC reduces the market barriers for communication services

High market barriers secured a solid market for telecommunications operators during the last several decades. Fixed and mobile network operators all around the world were able to post economic success on the basis of a global, standardized, interoperable network and the fact that both the network access and the service performance were covered in the added-value chain. On the other hand, they were obligated to fulfill the requirements of regulators, whether the assurance of interoperability among the operators, the emergency call service, telecommunications monitoring, or compliance with price regulations.

The development of the Internet, especially the introduction of Internet-based voice over IP (VoIP) technology, however, lowered the market barriers for communications services. A large number of so-called over-the-top (OTT) communication applications appeared. These services build on an existing Internet connection, are not subject to any regulatory requirements, and are free of charge in most cases. This development led to losses and shifts of revenues for the operators. As early as 2017, worldwide mobile network operators will realize just as much revenue with "mobile data" as with "mobile voice" – US$440 billion. And voice will continue to decline: to only US$409 billion in 2020.[1] The efforts on the part of the operators to develop new and innovative communications services have failed to materialize in many cases. This is a consequence of a defensive strategic orientation with the goal of securing revenues and the fear of cannibalization as well as in the lack of an IMS developer community.

Even more market barriers to communications services will fall with WebRTC. While VoIP still dealt with proprietary solutions requiring registration with user name and password as well as the application – Skype is a prominent example – real-time multimedia communication can be processed natively in the Internet browser and in mobile applications thanks to WebRTC; a "one-click" solution from a website is an example. Little effort for this is required as has been shown by the example of "appear.in",[2] a WebRTC-based video conference solution offered by the Norwegian telecommunications operator Telenor. The company required three students doing an internship during their summer holidays for the development of the first release and launched "appear.in" a short time later in 193 countries.

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[1] *Cf. Ovum World Telecoms Forecast Service, March 2016.*

[2] *Cf. http://www.webrtcworld.com/topics/from-the-experts/articles/372968-discussing-webrtc-with-sve-willassen-cto-appear.htm; https://appear.in.*

We consequently see WebRTC as an opportunity rather than a threat to telecommunications providers – the chance to promote new and innovative developments, to expand external and internal value generation, and to position themselves as operators in the Internet and web domain. But what concrete form might this take?

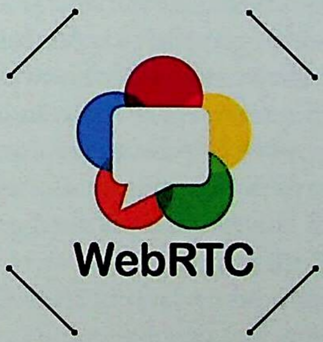
Definition of the playing field

A 4-point plan sketches out the options for action in the form of a "WebRTC playing field". Telecommunications companies can adopt this plan. It serves as a basis for orientation to achieve consistent implementation of this new technology.

Figure: WebRTC Playing Field

EAT YOUR OWN DOG FOOD
Consistent implementation of WebRTC technology within the company's added-value generation.

API PLATTFORM BETREIBER
Utilization of own assets such as customer base and network technology expertise to occupy a position as provider of programming interfaces.



MANAGED OTT
Acting as "managed over-the-top service provider", one that offers its product and service portfolio to new, previously "allocated" customer groups independently of existing contractual obligations.

3rd PARTY SERVICE PARTNERING
Build-out of an extensive cooperation approach with external, independent third-party providers for sustained implementation of WebRTC-based services in the service portfolio of the telecommunications provider.

Source: Detecon

„Eat your own dogfood": in-company implementation of WebRTC communications services:

The expression "Eat your own dog food" was first used by earlier startup companies such as Google and stands for the strict in-house utilization of a company's own products or services. The motto is this: "If you want to sell something successfully to your customers, demonstrate credibly its added value by using it yourself!" In the case of WebRTC, this philosophy stands for the comprehensive utilization of the technology within the scope of in-house collaboration opportunities such as WebRTC-based video presence training sessions. Technically, one can also imagine a modification of the service infrastructure for the end customers (first-level online customer support), and in view of the virtually full-area utilization of mobile devices with browser capability this is logically an almost obvious further development of existing and (in part) seemingly anachronistic communications options.

Build-out of a WebRTC-based "managed OTT service provider" for the expansion of telecommunications core services for customers:

The telecommunications industry has been struggling with a general problem for years: the established main markets for their services in fixed and mobile network communications are saturated. There are simply no more noteworthy customer groups in an industrialized country who are in need of a telephone contract. The game being played by everyone is "cutthroat competition". The technological basis of WebRTC-based services represents the first option to appear in many years that could change extensively the rules of this game. Using WebRTC technology, telecommunications providers could, for the first time, offer their services independently of contracts as browser-based services. In a world in which the digital transformation of our society is more and more frequently linked to turning away from the obligations of possessions – and the rise of flexible OTT service providers – this strategy is the equivalent of a paradigm change. Even in 2016, the business model of almost all established providers relies on contracts with a term of 24 months. With respect to customers, this transformation entails nothing less than a completely new relationship to previously exclusive added-value chains. For the first time, end customers can find themselves in a position allowing them to utilize additional services – entertainment, collaboration tools, or communications – from other telecommunications providers without being tied to a comprehensive contractual relationship over a period of months or having to give notice on their current contractual relationship. From the customers' viewpoint, this paradigm change appears to be logical. The question as to which provider will be the first one to take advantage of this is still open.

Direct integration of web-based services from third-party providers:
Cooperation with external providers of innovative services represents a valid option for the expansion of their own added-value chain for telecommunications providers worldwide. The US corporation AT&T, for instance, in cooperation with the audio communications experts from Plantronics, has introduced its Enhanced WebRTC API to the market. This principle can reasonably be pursued further with an eye on the establishment of WebRTC technology approaches. Established third-party providers are already delivering services to growing customer groups who will in the future generate even more added value through the consistent use of WebRTC technology. An example of this case is the control unit based in part on a browser from the smart home provider Qivicon.

The cooperation with agile and well-established providers that maintains value has extensive market benefits for everyone involved. The marginalization of telecommunications services is no longer a frightening prospect if a telco operator can find new customer groups outside of its previous core business field and convince them of its value. The interconnection of digital services will continue to propel this development.

Positioning as API platform provider:
By definition, telecommunications providers have a huge treasure chest of assets, whether a far-reaching network infrastructure, a highly diversified customer base, or extensive process experience. Established telecommunications corporations such as AT&T or Tata Communications have already begun exploiting these assets to counteract the marginalization of their core business. Telecommunications operators are in a comfortable position, analogous to the partnering approaches described above, for establishing themselves as independent providers for programming interfaces (APIs). Providers could in this way escape the risks posed by the Damocles sword of the "dumb pipe" and turn their core expertise into money again in these days of OTT managed communications.

Making profitable use of WebRTC

The WebRTC playing field has four interesting options for action. Telco operators should examine them to see which of the opportunities they can concretely realize; they can use this new and highly promising technology to address the target group of web developers, to reposition themselves in the Internet and web sector, and to make profitable use of WebRTC.

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[3] *Cf. http://about.att.com/story/webrtc_ces_2015.html .*

Strong Interest for WebRTC

What potential does Oracle expect in the new WebRTC technology for zits cloud business and the telecom operators? We asked **Kevin Pitts, Director Product Marketing, Enerprise Networks, Oracle Corporation US.** In this interview he tells what experiences Oracle has made with international WebRTC realizations at telecommunications operators.

ORACLE®

Interview

Question: The major challenges for Telco operators today are declining revenues, market saturation and increased competition of so-called OTT providers. One promising approach is telco enabling which foster innovation by partnering with other companies and empowers the companies to encourage their business models by providing telco assets. Does WebRTC fit to that approach and is WebRTC able to promote it?

K. Pitts: Yes, WebRTC does fit into this "CPAAS" or Communications Platform as a Service model and a couple of others for Telco operators. In EMEA, large operators are adding WebRTC services to existing 'land lines' in order to keep consumer and business customers by adding more features for close to the same monthly amount. These carriers are also offering these "as-a-service' options to other operators and enterprises.

Companies that are incorporating WebRTC into web pages and mobile applications are promoting it as "video calling" or "video conferencing" and not as WebRTC. Conversations about using video are much more appealing than real-time enabling web pages or mobile applications. Many organizations fear the complexity of integration and this is another opportunity for carriers to help their CPAAS customers integrate the technology and support more use cases.

Question: So WebRTC "connects" the two worlds web and telecommunication – but is it more a technology for the web or more for telecommunication? In other words: Who will profit more from WebRTC?

K. Pitts: At Oracle, we are seeing strong interest in WebRTC as part of our cloud business. For example, Oracle Service Cloud customers are enhancing customer experiences on web pages and mobile applications by adding text/audio/video channels. Enterprise customers of Oracle Service Cloud are able to selectively offer additional channels between customers and agents to deliver the most desired information quickly and easily. Customers get the information that they need before, during and after the sale of products and services. This increases customer satisfaction, loyalty, and spend. This in turn increases the revenue for the companies that deploy these use cases on their web sites and mobile applications.

The Telco operators that offer easy to deploy WebRTC packages and the organizations that deploy them soonest will profit first. It is difficult to say who will profit most.

Question: What could be the key assets a telco operator is able to provide e.g. for a WebRTC software and web developer?

K. Pitts: A strong and well-documented API (application programming interface) to connect to existing telephone and contact center platforms is required. This gives the internal telephony and contact center team an understanding of how the WebRTC solution connects to in-place platforms. APIs that offer the most flexibility give the internal team the opportunity to deploy the solution within their own design. These teams know the use cases needed to support customers and need that extra flexibility.

In addition, an SDK (software development kit) is also required. This will allow the mobile applications team to 'communications enable' the mobile app without having to learn about complicated telecommunications protocols. The SDK will manage the connections to the WebRTC solution for them. For instance, they will not have to learn about audio and video codecs.

Beyond a strong software solution with a good API and SDK, a technical team to support the customer is also required. Even technically strong customer teams will need some assistance with deployment, testing, evaluation, adjustments and eventually a transition to production.

Question: WebRTC provides the so-called data-channel which is associated to IoT and M2M. Which role might an operator play for WebRTC-enabled IoT applications?

K. Pitts: Operators and Communications Service Provider (CSP) have three ways to monetize IoT: First by selling connectivity, second by selling bundled IoT enablement and third by selling IoT services.

Connectivity is the easiest thing for a CSP to offer The CSP can leverage its communication network and provide the connectivity needed for the devices. This will require SIM cards, network, connectivity management, these are all things the CSP already has or can easily get. Virtually every CSP already provides connectivity for IoT or M2M. The only challenge is that connectivity is a small slice of the overall IoT revenues: 10% or less.

CSPs can do more than connectivity and for many of them the natural next step is to provide Bundled IoT Enablement. This includes the connectivity bundled with IaaS, such as storage and computing, and an IoT enablement platform. With the success of IoT, the number of startups companies providing IoT services will explode and a CSP can provide to these companies and to enterprise all they need to develop the IoT services: The Connectivity PLUS Storage and Computing cloud services PLUS IoT enablement platform.

Finally at the highest level of maturity in IoT Monetization, a CSP will provide IoT services to enterprises and consumers. This could include Machine-to-Person and resulting person-to-person communications that could be provided by WebRTC.

For example this could include Telematics services to automaker, Fleet management services to enterprises, Asset tracking and monitoring, Connected building and security and so on.Providing this type of services requires considerable investment on the CSP side, but will also produce the largest value.

Question: What are the key aspects for future success in WebRTC implementations?

K. Pitts: Future success depends on: Providing a WebRTC package that is easy to trial and convert to production. Showing enterprises that WebRTC use cases can significantly drive customer satisfaction, loyalty and revenue. "Turn Key" offers from Operators and partners that ease the burden for customers with no mobile application or web page development teams. Enterprises ability to identify, train, and support a contact center team for 'video'.

Question: WebRTC might be seen an extension of IMS from operator network perspective. Is it sufficient to cover WebRTC by operators' IMS experts or is a dedicated "digital services" unit necessary e.g. for API platforms?

K. Pitts: Oracle has observed different operator approaches on this topic. With some operators, the IMS experts that have built the operator's SIP network are also chartered with building out WebRTC network assets. Alternatively, we observe other operators that are leveraging their digital services team, which typically has strong experience with APIs and web services to focus on WebRTC.

Question: What are the key hurdles today?

K. Pitts: We have seen that some operators are reluctant to embrace the technology evolution that is required to be successful with WebRTC. However, we feel that it just a matter of time before WebRTC becomes a dominant technology in operator networks.

Question: Is a mid-set change also necessary? Should an operator also establish agile processes and methods like design thinking?

K. Pitts: Agile processes are always a good idea regardless of the technology involved. We observe many of our operator customers embracing agile methodologies as a means of modernizing their processes and attaining a competitive advantage.

Kevin Pitts leads global enterprise product marketing for the WebRTC Session Controller, and Enterprise Session Border Controller at Oracle Communications. With twenty years of communications industry experience, he has significant knowledge and expertise in a broad range of communications products, service models and architectures related to enterprise collaboration. Before joining Oracle, Pitts held leadership roles in call center operations, product development, and product management at Confertech/Global Crossing, Polycom, and Avaya.

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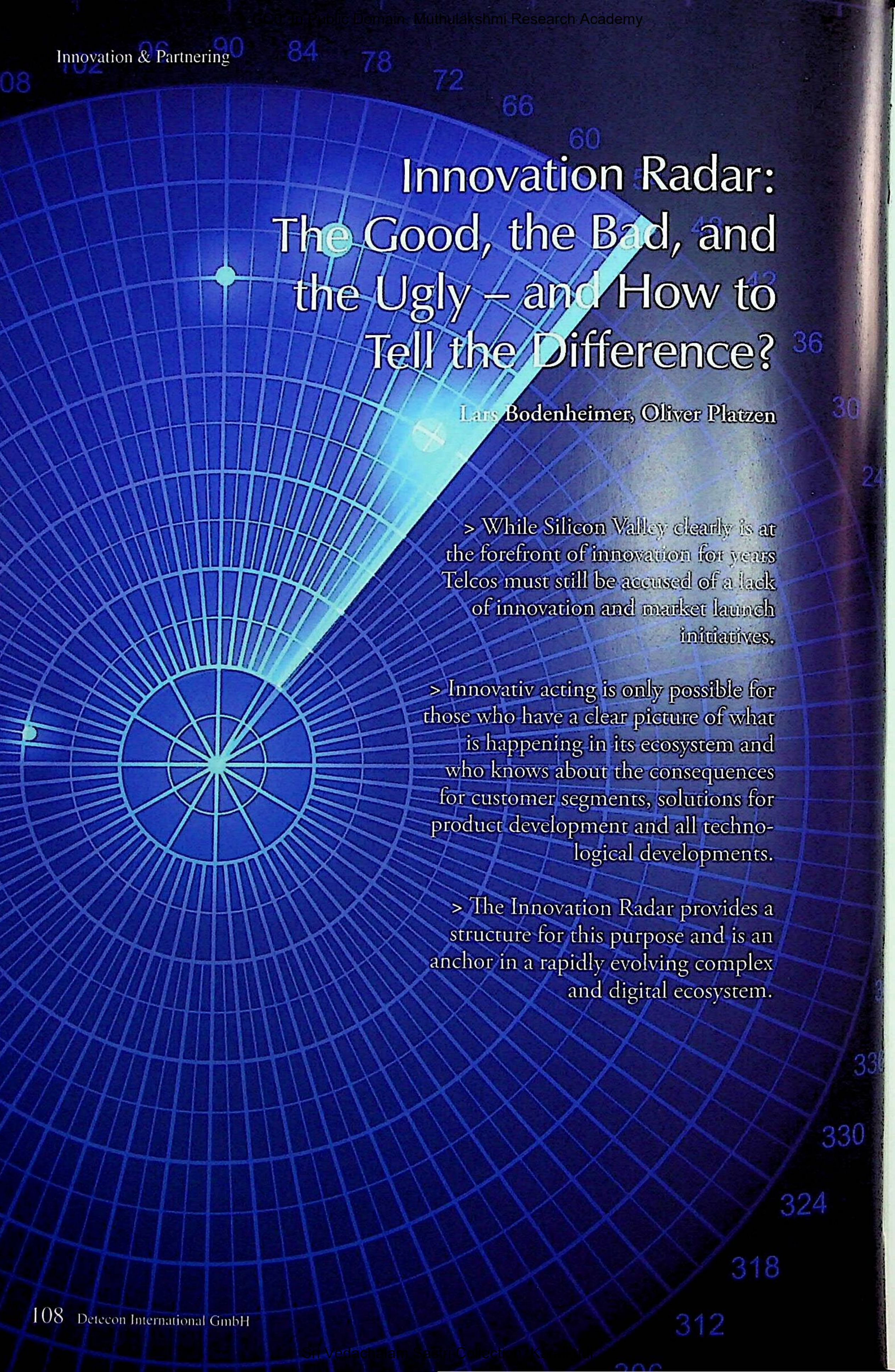

Innovation Radar: The Good, the Bad, and the Ugly – and How to Tell the Difference?

Lars Bodenheimer, Oliver Platzen

> While Silicon Valley clearly is at the forefront of innovation for years Telcos must still be accused of a lack of innovation and market launch initiatives.

> Innovativ acting is only possible for those who have a clear picture of what is happening in its ecosystem and who knows about the consequences for customer segments, solutions for product development and all technological developments.

> The Innovation Radar provides a structure for this purpose and is an anchor in a rapidly evolving complex and digital ecosystem.

The United States have been trailblazing telecom innovation for over 10 years now and since 2007 alone, over $190 billion in venture capital investments have been made in US telecom and technology startups. Compared to other main telecom innovation hotbeds, in particular Europe, China, Israel and India, the US accounts for close to 70% of the total funds.[1]

Why the pilgrimage to Silicon Valley?

With 3 times more telecom investments and startups than any other region in the US, Silicon Valley is clearly at the forefront of telecom innovation. There are more than 23,000 start-ups in the Silicon Valley alone [2], according to the Global Entrepreneurship Monitor [3] there are more than 100 million businesses launched globally every year. Even though 90% of tech start-ups fail, this leaves a sizable number of start-ups to be watched for their business potential. Today over 25 fixed, wireless, and satellite operators from various parts of the world have outposts in and around the San Francisco Bay Area. Even those without a local office presence often send their carrier scouts to the West Coast on a regular basis in order to dig up interesting ideas, technologies and companies. Among these Telcos' objectives there is one common denominator: To find the next big thing, or at least that new competitive edge over their rivals, be it other Telcos or non-Telco players.

Many large and small telecom companies have difficulties with embedding and maintaining an ongoing integrated market intelligence and foresight, which unifies the commercial (products & services) with the technology (IT, Network) view on market shifts and impact potential. Subsequently they are faced with a lack of agile and applied innovation and go-to-market capabilities. In need of an effective reaction to digital industry changes and disruptions or an proactive implemention of countermeasures, manyare left with a mix of challenges which they hope to resolve or at least mitigate by setting up shop exactly where most of the digital disruption is born.

But just opening up an office in the Valley and transplanting a bunch of lucky expatriates, equipped with a laptop, a stack of business cards and a surfboard, to sunny California, is not cutting it. The tools being utilized by Telcos in the Valley range from scouting programs, mass outreach, events, to venture fund and strategic partnerships, with the setup of labs and incubators seeing the most growth recently.

[1] *Telecom Council of Silicon Valley*

[2] *AngelList, 2016 (https://angel.co/silicon-valley)*

[3] *http://www.gemconsortium.org/*

This broad array of activities is underlined by a not lesser variety of Telco innovation priorities pursued by operators in the Bay Area, as the following overview from select Telcos with local presence shows.

Is this just a Telco issue?

Besides telecom players, individual companies in other industries and entire sectors are shaken and waking up, feeling the heat of digital disruption by a

Table 1: Extract of Innovation Priorities of Select Operators with Silicon Valley Presence [4]

Bouygues Telecom • Apps & accessories for TV • Internet of Things over LTE • Password management & cloud security • Indoor localization	BT • Ultra-fast broadband services • Content interactivity • Software Defined Network • Big Data internally & go-to-market
中国移动 China Mobile • Carrier-grade & federated network • Trusted communication environment • Flexible device solutions • Open system architecture	EE • 100% coverage (small cells, macros, drones, balloons, etc.) • 100% reliability (satellite backhaul, device-to-device, self-healing networks) • 100% performance (mobile edge computing, open source networks)
Designing The Future KDDI • Customer experience • Entertainment, FinTech • Internet of Things (edge computing, connected home) • Authentication (ID Management)	NTT docomo • Social network of things • Crowd-sourcing • Little data • The future of work
ooredoo • API & Ecosystem Partnerships • Mobile Advertising • Mobile Identity • Internet of Things	ROGERS™ • Best in class customer experien • Market share in business segment • High-performance engaged workforce • Disruptive technologies in wireless (data), residential (connected home), media (interactivity)
SK telecom • IT infrastructure (SDN/NFV, cloud storage, mobility) • IoT (beyond sensors/devices, management layer) • Advanced media platform (personalization, context-awareness, analytics, delivery, discovery) - Lifestyle enhancement platform	Sprint • Digital lifestyle (self-service, buying experience, usage insights) • Customer experience (customer care, business intelligence) • Entertainment (streaming, content portfolio) • Robotics

Source: Detecon

multitude of small single-purpose players and larger ecosystem companies, chewing away on core revenues and value propositions of these long-established industry players.

Industries like Energy, Health, Manufacturing, and Automotive are starting or accelerating initiatives to beef up different stages of their innovation lifecycle, knowledge, culture and processes not just through focused innovation research & analysis but also, similar to Telcos, through direct exposure to innovation hotbeds reaching from Silicon Valley to Berlin, the Middle East and other high tech epicenters.

But even after realizing that the wind is changing and that existing revenues need to be protected or new revenue channels and business models need to be thought up or costs to be cut, many are overwhelmed with grasping the evolving complexity of the new digital ecosystem they are in: players and activities that may affect them already or down the road, and new opportunities that are out there in form of new products or services, technologies and suppliers or partners.

In 2006 the MIT Sloan Review issued an article with the title: "Companies with a restricted view of innovation can miss opportunities. A new framework called the Innovation Radar helps avoid that." It talked about how big companies were facing challenging environments and referring to a need for innovation, in that "innovation will be the compass by which the business sets its direction" (Ford), that "innovation is central to the success of a company and the only reason to invest in its future" (General Electric), and that "innovation is the only way to keep customers happy and competitors at bay" (Microsoft). The framework was developed to assess business innovation within global enterprises with complex activities, including R&D.

What happened since then? The main challenges from 10 years ago still apply – slow growth, commoditization, global competition. But what else? Linear value chains, from Production to Sales, are outdated. New value networks are enabled by web and mobile, emphasizing on the customer interface, often detached from infrastructure, content, assets. Popular examples like Netflix in video, Amazon in ecommerce and cloud computing for businesses, Apple in smart devices and computers, Uber in transportation, Airbnb in hospitality are all evidence that technology enabled by web, mobile, software is disrupting many industries. For

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[4] *2016 Global Telco Innovation Targets (www.telecomcouncil.com/TC3).*

[5] *Mohanbir Sawhney, Robert C. Wolcott und Inigo Arroniz (2006), MIT Sloan Management Review (http://sloanreview.mit.edu/article/the-different-ways-for-companies-to-innovate/).*

digital players, such as telecom operators, this means the majority of innovation happens outside of their sphere of control. But the digitization and respective trends spreading across different industries are important success factors which need to be identified, evaluated, sorted out and pursued or implemented. In-house innovation had to be complemented with external innovation awareness: Therefore another form of an innovation radar with a more external view was established and used simultaneously to the internal radar. Well-known examples for these innovation trend radars are the Cisco Technology Radar, the DHL Logistics Trend Radar or the EIT Digital Radar.[6]

Szenarios and targets

We have witnessed the need for structured innovation management and tools like innovation radars as one component of it through the last decade in working with multi-national telecom operators and companies in many other industry

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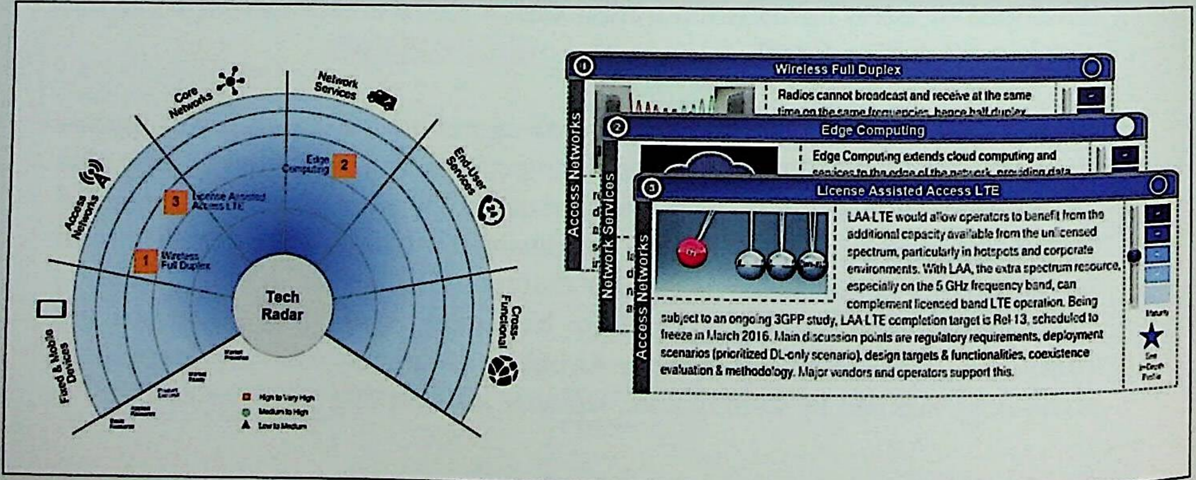
[6] *Cisco Technology Radar (https://techradar.cisco.com/), DHL Logistics Trend Radar (http://www.dhl.com/en/about_us/logistics_insights/dhl_trend_research/trendradar.html), EIT Digital Innovation Radar (https://www.eitdigital.eu/news-events/publications/innovation-radar/).*

Figure 1: Exemplary Radar Layout and Short Profiles


Tech Radar
Core Networks
Network Services
End-User Services
Cross-Functional
Fixed & Mobile Devices
Access Networks
1 Wireless Full Duplex
2 Edge Computing
3 License Assisted Access LTE
Market Presence
Market Ready
Product Launch
Applied Research
Basic Research
High to Very High
Medium to High
Low to Medium
1 Wireless Full Duplex
2 Edge Computing
3 License Assisted Access LTE
Access Networks
Network Services
Access Networks
Maturity
See In-Depth Profile

Radios cannot broadcast and receive at the same

Edge Computing extends cloud computing and

LAA LTE would allow operators to benefit from the additional capacity available from the unlicensed spectrum, particularly in hotspots and corporate environments. With LAA, the extra spectrum resource, especially on the 5 GHz frequency band, can complement licensed band LTE operation. Being subject to an ongoing 3GPP study, LAA LTE completion target is Rel-13, scheduled to freeze in March 2016. Main discussion points are regulatory requirements, deployment scenarios (prioritized DL-only scenario), design targets & functionalities, coexistence evaluation & methodology. Major vendors and operators support this.

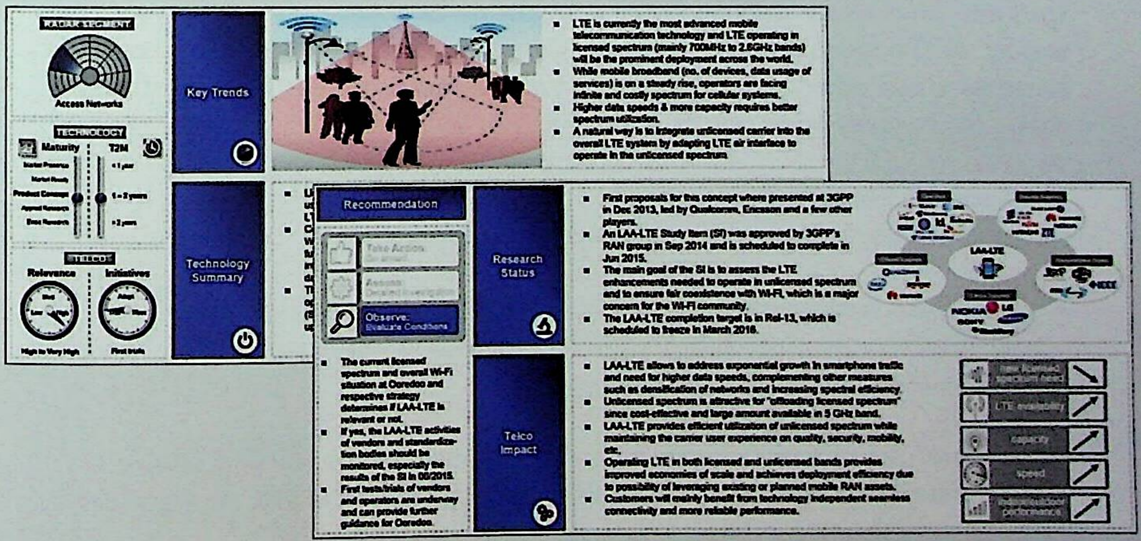
Source: Detecon

sectors. In principle not much has changed since then. The radar screen is still the visual front-page of a more extensive analysis, which includes customizable elements such as individual items spread across the radar dimensions, categorized into different maturity stages and relevance ratings, assessments of market- and customer-specific defined metrics at different levels, tracking tools, and prioritization methods.

With the number of promising innovations increasing and at the same time decreasing ability of a company to invest in too many lemons, a fully functioning filter is required to maximize its chance to identify winners when performing radar exercises. And these filters also need to be well aligned with the specific circumstances of the respective business, to fully reflect strategic targets, market environment, customer demands, etc.

The methodology to arrive at such end results can be applied to any innovation radar effort. It is constructed of different phases and activities within each phase, which eventually allow an execution on identified short-listed innovations.

Figure 2: Exemplary Radar Topic Deep Dive


RADAR SEGMENT
Access Networks
TECHNOLOGY
Maturity
T2M
Market Presence
Market Ready
Product Concept
Applied Research
Basic Research
< 1 year
1 – 2 years
> 2 years
TELCO
Relevance
Initiatives
Low
Mid
High
Adapt
High to Very High
First trials
Key Trends
Technology Summary
Recommendation
Take Action
Assess: Detailed Investigation
Observe: Evaluate Conditions
Research Status
Telco Impact
LAA-LTE
NOKIA
LG
SONY
BlackBerry
3GPP
IEEE
LTE availability
capacity
speed
performance

- LTE is currently the most advanced mobile telecommunication technology and LTE operating in licensed spectrum (mainly 700MHz to 2.6GHz bands) will be the prominent deployment across the world.
- While mobile broadband (no. of devices, data usage of services) is on a steady rise, operators are facing infinite and costly spectrum for cellular systems.
- Higher data speeds & more capacity requires better spectrum utilization.
- A natural way is to integrate unlicensed carrier into the overall LTE system by adapting LTE air interface to operate in the unlicensed spectrum

- First proposals for this concept where presented at 3GPP in Dec 2013, led by Qualcomm, Ericsson and a few other players.
- An LAA-LTE Study Item (SI) was approved by 3GPP's RAN group in Sep 2014 and is scheduled to complete in Jun 2015.
- The main goal of the SI is to assess the LTE enhancements needed to operate in unlicensed spectrum and to ensure fair coexistence with Wi-Fi, which is a major concern for the Wi-Fi community.
- The LAA-LTE completion target is in Rel-13, which is scheduled to freeze in March 2016.

- LAA-LTE allows to address exponential growth in smartphone traffic and need for higher data speeds, complementing other measures such as densification of networks and increasing spectral efficiency.
- Unlicensed spectrum is attractive for "offloading licensed spectrum" since cost-effective and large amount available in 5 GHz band.
- LAA-LTE provides efficient utilization of unlicensed spectrum while maintaining the carrier user experience on quality, security, mobility, etc.
- Operating LTE in both licensed and unlicensed bands provides improved economies of scale and achieves deployment efficiency due to possibility of leveraging existing or planned mobile RAN assets.
- Customers will mainly benefit from technology independent seamless connectivity and more reliable performance.

- The current licensed spectrum and overall Wi-Fi situation at Ooredoo and respective strategy determines if LAA-LTE is relevant or not.
- If yes, the LAA-LTE activities of vendors and standardization bodies should be monitored, especially the results of the SI in 06/2015.
- First tests/trials of vendors and operators are underway and can provide further guidance for Ooredoo.

Source: Detecon

Common radar stages cover initial discovery, long-list filtering, short-listing, short and in-depth profiling, including a versatile list of KPI assessments to allow for decision-making concerning next steps. The advantage of this approach is, that it is adaptable to different industries, divisions, target audiences, topics and purposes and its execution and visualization is 100% customizable to stakeholder needs.

Over the last 5 years we have noticed a significant uptake in adoption of these radars as a key lever for companies who desire to understand what is floating in the innovation pool, which is evidence for the value of the approach as such. Still, there are some important questions one should have an answer to, before allocating budget to such an effort:

> What can innovation radars being used for and by whom?
> How does the radar fit onto a strategy & innovation management timeline?
> How often should it be done or updated?
> Who can or should do it?
> Which buy-in and interfaces are needed internally to maximize the benefit?
> How to best execute on short-lists and recommendations?

Below we provide some examples of how the radar logic can be applied in different scenarios and with different intentions.

Multiple Views: Innovation radars are a vehicle to allow companies market perspectives from many different angles. It can be used for outlining trends in respect to products, services, technologies, adjacent (cross-) industries, socio-economics and other areas. It can be used as a discussion basis for experts to define the importance of certain external factors & innovations.

Kickstarter: If conducted as a one-time snapshot of defined dimensions it can jumpstart or inspire strategy or roadmap planning exercises.

Periodic: These radars are used as an ingredient to feed into market or ICT technology research, often combined with tracking of innovations in terms of how they materialize and mature over time.

Management Dashboard: It is also a very simple management tool to be able to convey strategies or background to certain chosen paths and to give management a guidance for decision making.

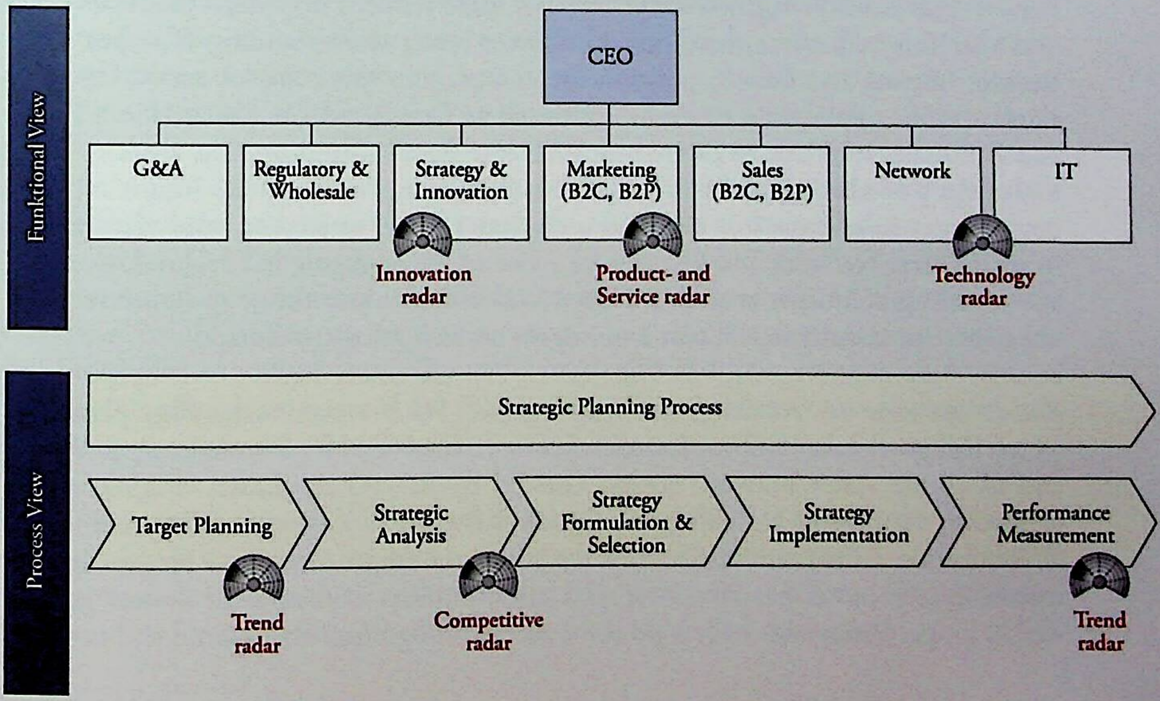
Spying Glas: Infused with a competitive analysis spin, it can provide transparency on peer activities, market entrants and industry practices of players across the world. As radars can offer very different means for different target groups, it can be quite a powerful lever for market challengers to identify ways to compete with incumbent or larger-scale players.

Cross-Fertilizer: For a telecom operator an innovation radar can be, besides above application fields, the cornerstone of an analysis that shows how product or service developments impact technologies, IT and network infrastructure.

Impact Gauge: For a telecom operator an innovation radar can be, besides above application fields, the cornerstone of an analysis that shows how product or service developments impact technologies, IT and network infrastructure.

Partner-Pool: Partnering, as another crucial element of today's Telco player reality, will depend heavily on the operators' capability to identify, assess and prepare for potential cooperation targets. Excellence in this first evaluation step is crucial for

Figure 3: Radar Application Examples Across Organizations or Processes


Funktional View
CEO
G&A
Regulatory & Wholesale
Strategy & Innovation
Marketing (B2C, B2P)
Sales (B2C, B2P)
Network
IT
Innovation radar
Product- and Service radar
Technology radar
Process View
Strategic Planning Process
Target Planning
Strategic Analysis
Strategy Formulation & Selection
Strategy Implementation
Performance Measurement
Trend radar
Competitive radar
Trend radar

Source: Detecon

success, as it directly impacts the probability of successful monetization of innovations. Within potential service partnerships or acquisitions the timing element is of utmost importance. The faster an upcoming opportunity can be identified against competition, the higher the chances of being able to exclusively monetize on such a service for the longest time. Also an effective market scouting increases the chances of decreasing total T2M and hence TCO.

As with most industries, the telecom market is constantly evolving which makes market intelligence and visibility a key ingredient in strategy and planning exercises.

How would this look like for specific trends?

To illustrate the multitude of application options an innovation radar offers, we outlined two examples for current innovative communication industry topics below: Internet of Things (IoT) and Fifth Generation Mobile Network Technology (5G).

Structure and filter complex ecosystems: The Internet of Things is a very broad term and spans across many different applications, technologies, business models, players and industry segments. But it is on most telecom operators' roadmaps and therefore requires a dissection to allow a better understanding of opportunities, threats and how to position the company in this complex ecosystem. From specific application environments such as Connected Car, Smart Home, and Industrial Internet, to entire industries like Retail, Transport and Health – each field provides a host of IoT use cases. Marketing wants to tap into it for new sources of revenue but needs to understand when which use cases mature in which area. Network and IT must be aware of the emerging IoT technologies and enabling platforms as well as players and link this knowledge to respective infrastructure requirements, cost and impact on technology roadmaps.

End-to-end view on technology-enabled evolution: 5G is a pure technology play, which brings together a host of wireless access technologies for a more integrated and of course faster network access. Guided by the 5G objectives, originally defined by the project METIS [7], one already derive possible areas for a 5G-specific innovation radar exercise. The new technology is supposed to allow for higher mobile data volumes per area, user data rates, number of connected devices as well as longer battery life of low power devices and significantly reduced end-to-end latency. These objectives generate specific user and network driven requirements for 5G and will foster innovations across network and IT technologies, devices and applications in many consumer and business environments, with use cases reaching from IoT, context aware services, public safety, to extreme video and gaming applications, explosive data density usage and the retirement of legacy communication systems.

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[7] *METIS System Concept: The Shape of 5G to Come (https://www.metis2020.com/wp-content/uploads/publications/IEEE_CommMag_2015_Tullberg_etal_METIS-System-Concept.pdf).*

As shown in above examples, an innovation radar can be applied to shed some light on some of the previously highlighted questions. The format, breadth and depth can be adapted, depending on the topic, purpose, audience, frequency and desired decision factors. The broader application in core telecom fields like IoT, 5G and other popular topics can of course be much narrower in form of more specialized radar editions.

It goes without saying, that each of those versions can be broken down further to highlight specific aspects, for example more product- or service-oriented or technology-focused analyses.

Use the Innovation Radar as an effective management tool

Innovation radars are increasingly utilized across industries and companies are making use of the versatile nature and customization options. However, all radar activities are meaningless and a waste of money, if the objective is not clear or how the results will be applied and by whom, be it as an exercise to source items for roadmaps or to identify prospects for partnering or acquisitions. Therefore, not only the ultimate outcome has to be very clearly defined but also the required stakeholders and decision makers which can take it to the next step.

In summary, companies of different industry background and size can benefit and should utilize the innovation radar as an effective management tool since they offer maximum scalability to the needs and budget of companies in terms of depth of analysis, focus of the analyzed segments, iteration of market scans, etc., despite the fact that the internal drivers for radars can be very different.

Digitization impacts all sectors that struggle to get a clear picture of what is happening in the ecosystem, how it affects customer segments, product development approaches, technology evolution. The innovation radar offers to provide structure and focus in a rapidly developing, complex digital ecosystem.

■

A Question of Trust

Telecommunications companies (telcos) face a growing threat from OTT players, which, as the innovation pace-setters at the service level, are taking over the benefit of the end-customer relationship step by step. As if that were not enough, companies like Google, Apple and Facebook are also occupying the field of connectivity through such activities as Google Fi, Google Loon, eSIM or Internet.org, as well as new terminal equipment in the home, such as the Google router or Amazon Echo. **Christian von Reventlow, Product & Innovation Officer of Deutsche Telekom,** counters with the values of trust and reliability.

Interview

Question: A straight question at the beginning: Do traditional network operators or telcos run the risk of being relegated to the position of upstream providers for OTTs and finally losing all contact with end-customers going forward?

C. v. Reventlow: For traditional network operators, this is definitely a significant risk. The OTTs continue to invest in building out their individual ecosystems, and this could at some point enable them to take over all end-customer contact. In technical terms, there is no real problem in selling or bundling connectivity with an ecosystem, and this will be even simpler in the future with the introduction of the eSIM. Under their current business model, telcos earn money when customers pay for services that run on their networks. Thus the risk is that by devaluing our premium services, the OTTs will disrupt this model.

Question: How high do you assess this risk for DTAG and for the European market?

C. v. Reventlow: We will not become and do not want to become a second Google. Telcos need to find their own way. One approach is to strengthen the value of telecommunications services such as reliable, secure connections, protection of critical data, etc. The risk does of course exist in Europe as it does in other markets. Nevertheless, DT has a good chance of avoiding this "dumb pipe scenario" through new offers and its own platforms.

Customer demand for security and reliability of processes is rising; more and more services rely on 100-percent functioning and the ability to send and receive data without delays. So there is a growing need for a kind of "serious web," and we are very well positioned to meet this need. Our focus on the network side is on seamless, secure connectivity and, for business customers in particular, on a global scale and with quality differentiation.

Question: What in your view are the central assets of the telcos and specifically of DTAG that will give the OTTs a run for their money?

C. v. Reventlow: We want to link innovation with Deutsche Telekom's fundamental values of trust and reliability – to offer customers "Innovation you can trust" – innovative products that work simply and interplay seamlessly with network, service, and partner offers. To deliver this kind of innovation, our Group Innovation and our core business units must work together, focusing on our four interlinked innovation areas: consumer products, business customer products, networks and infrastructure, and processes/service. The connectedness between these innovation areas is absolutely critical. Our network is the heart of all this, of course, and our expertise in network management and operation are core assets. When we look at customer needs, whether individual consumers worried about identity theft or business customers looking to utilize big data, it's clear that data protection is high on the list, and I believe the German reputation in this regard is one of DT's core assets. A pure data-driven business model is probably not right for us, but what is more exciting could be the business we can build up around trust and privacy management, in which we give customers back control over their data or offer them identity management solutions. We can do this because our business model is not based on the cannibalization of customers' personal data.

Question: How important is the network in this context? Does superior network quality matter as a differentiator in the long run or will connectivity become a commodity that in extreme cases is provided to customers free of charge, like so many other services?

C. v. Reventlow: The network always was and is still now a core asset of companies like DTAG, and in the future it will grow even more important to the products and services we and our partners offer. Thus the network is the central control or value point by which we differentiate ourselves and ensure future revenues. Connectivity as such is becoming increasingly ubiquitous. But as already discussed, for many services, customers need special types of connectivity (highly flexible, secure, low latency, etc.). This is driving, for example, the development of 5G networks. As such, connections differentiated by quality will continue to account for a large proportion of our revenues in the long run. In addition, the network will grow more intelligent in the long term, through SDN-driven virtualization and automation, automatically providing customers with the particular connection required depending on device, location, and service.

The question of what can be offered to counter the free-of-charge culture is also a question about the role that we can play. We see ourselves in the future as a neutral, trustworthy "advisor" who orchestrates for customers the ecosystems that surround them. This brings me back to the question of trust. DT will become the trusted companion in our customers' digital lives and businesses.

Question: What role will an integrated network approach play as a possible differentiator. How important is it as a telco to have both network domains – fixed and mobile communications networks – so as to make high quality seamless connectivity a reality?

C. v. Reventlow: It is an absolute must to be able to offer such seamless connectivity. This isn‘t possible without an integrated network approach. Customers want to have the connection they need for digital services at all times, regardless of their location or application scenario. As an integrated network provider, it is possible to meet this need, regardless of the respective access channels.

Question: What key technological developments do you see in the area of networks? Do you perhaps see a distinction between short-term and long-term prospects? In your view, are there any technologies of a disruptive nature or are the advances in networks tending to develop incrementally?

C. v. Reventlow: As Group Innovation, we focus more on long-term issues, such as making the network much more intelligent in order to independently manage the network connections of all connected devices. This will require an ability to treat network traffic differently depending on its type, and also implement sophisticated load balancing. Software-defined networking, which is disruptive for telecommunications companies, is a core element in being able to resolve these challenges.

Of course, there are many incremental innovations in the access area (e.g., vectoring, supervectoring, G.Fast), as well as potentially disruptive ones (e.g., LiFi). A relatively new issue is edge intelligence, in which latency-critical applications are processed close to the telecommunications termination point in order to enable the low latencies necessary for some critical Industry 4.0 applications. However, this contradicts the long-standing paradigm of the centralization of data centers to optimize production.

Question: Talking of services: How can the telcos manage not to lose the end-customer relationship entirely to the OTTs at the service level? What service areas with a „right to win“ are being considered by the telcos? Could there possibly be different opportunities for the telcos here in the consumer and business customer segment?

C. v. Reventlow: With the exponential development of technology, complexity will increase dramatically for end- and business-customers alike. As a trusted companion in the consumer realm and a trusted assembler in the business space, we are positioned to curate the best offerings and thus reduce this complexity. In my opinion, that role establishes DT's right to play vs the OTTs on some very strong foundations.

As communication services become increasingly embedded in customer critical operations and processes, Deutsche Telekom will provide the necessary, next generation quality network. The serious web is about improving lives, businesses, and communities, and DTAG has a reputation as trusted partner of quality-critical services. And at the same time, our refusal to compromise data privacy has helped us build a differentiating strong brand of trust with customers who demand full control of their data.

Question: When it comes to innovations by telcos at the service level, how do you see the relationship between primary in-house innovations and a partnering approach with smaller, specialized OTTs like Dropbox, Spotify, Netflix, etc. or large ecosystem providers like Google, Apple, etc., which the telcos are likely to be in even tougher, direct competition with in the foreseeable future?

C. v. Reventlow: „Win with partners“ is one of the four elements of Deutsche Telekom's strategy. This underscores the importance of cooperation for Deutsche Telekom's future success. We focus our own innovation efforts on our network as our core capability and control point. In the OTT products and services layer, we give a stronger preference to innovative solutions developed by partners to enhance the range of our products and services. We see our role as that of an eco-system orchestrator that attracts start-ups as well as established service providers. This way, in-house ideas can be enhanced by developments of our external partners. Intelligent approaches can often be cleverly combined, so that the blend gives the customer an even more satisfactory experience. The fact that we cooperate and compete with companies at the same time – take Google or Amazon – is a normal competitive process, sometimes called „coopetition“.

Question: What conditions would have to be in place for a working partnership on both sides opening up of the networks by providing APIs that enable, for example, access to QoS parameters, location, customer information, security, data protection concerns, business models, etc.?

C. v. Reventlow: As well as developing in-house solutions, Group Innovation collaborates with partners on innovations. To make that collaboration work, we need to be able „culturally“ to integrate partner organizations and further develop and enhance partner products. So partnering doesn't mean reducing our own in-house innovation expertise. We need that expertise just to even identify the right partners in the first place.

In the case of our consumer and business customer offers, our aim is to offer a simple, modular product portfolio and at the same time combine our products intelligently with products from our partners. This also means that the underlying processes and customer services need to reflect the entire DT ecosystem. That is to say, we need to (mutually) open up our systems by providing APIs, for example, so we can collect customer information in an integrated way. It must also be possible, for example, to manage „pre-customer“ booking or payment processes end-to-end.

We have a very broad spectrum of partnerships, but the more deeply they are integrated into our own offerings, the greater the need to „open up“ and adapt to each other, e.g. in terms of access to QoS parameters, security or data protection matters.

Question: Could it perhaps also be useful to have additional „digital units“ that speak both the language of the web or app developers and the language of the telco?

C. v. Reventlow: In my opinion it is of the utmost importance that every unit in a telco be able to „speak“ and integrate IT and software with the core telecommunications knowledge. That is why we established Group Innovation+ as DT's central corporate innovation hub to orchestrate the product development and innovation initiatives of our various business segments. At the same time, it does make sense to run market-facing units that provide both marketing and sales expertise as well as deep domain knowledge in vertical markets like security, cloud, or new growth markets like M2M or health.

Question: What opportunities for monetization do you see for new telco services developed in-house or fostered through partnerships; are there options for additional revenue per customer given the „for free“ mentality?

C. v. Reventlow: Monetization opportunities arise from the fact that we, as Deutsche Telekom, don‘t need to hide our light under a bushel. We should tackle new topics with ambition, which doesn‘t exclude starting small and upscaling later (fail early, fail cheap). We need to approach topics holistically and not piecemeal or in isolation, but in a connected and integrated way, so that these topics later have the opportunity to make a significant contribution.

We continue to offer premium services. We have made a splendid first move in Germany with the convergent consumer products in our MagentaONE portfolio, and international roll-out has already begun. Group Innovation+ is working to integrate more services in this convergence strategy and, in doing so, to increase the attraction of the MagentaONE offers.

The focus is always on our customers, whether consumers or business customers. It's about creating added value for the customer, by identifying new customer issues, anticipating their needs, and finding innovative solutions in response. The question is how we can differentiate ourselves for customers. I have already mentioned a number of examples that may arise from our core, the network, but also, e.g., from our trust role, and which could lead to new products and services, or even the application of new business models to existing offers.

The identification and appointment of new control points plays a major role in this regard. For example, one focus is currently on end-to-end customer process management and digital mapping. By ensuring a constant level of quality and a consistent service experience across all contact channels, we can anticipate and meet the needs of our customers and even address them proactively. Interactions with the customer become much more personalized and context-sensitive.

I should add that just as our OTT competitors are „bonding“ together, so are the telcos. There are, for example, various initiatives in place for creating a counterweight to Google.

Question: What fundamental technological developments that perhaps will be more effective in the long term can you see, which enable new service scenarios? What benefits can the telcos draw from these developments?

C. v. Reventlow: If we look back in history, technology has improved just about every metric we have with regard to society and humanity. And in the future, that impact will accelerate exponentially. Technology will disrupt every aspect of our lives, including business, industries, and society as a whole.

There are five fundamental truths in the future world DT will compete in:

1. Information is ubiquitous: Our ability to access, acquire, and use information will amplify. We will have a real-time stream of relevant information, accessed through a multitude of devices and mediums.

2. Security is privacy: In our networked future, our interactions will generate a huge amount of personal data, and the real-time protection and control of this data will be increasingly critical.

3. Technology is empowering: Our close relationship with technology will enable specially curated experiences and assistance with mundane tasks. Technology will be the cornerstone of our support ecosystem, providing convenience and ease.

4. Technology is invisible: Our patterns in life will be well documented by invisible sensors capturing and analyzing all forms of data. There will be no indicators of whether you are online or offline; you will simply move through life connected by the objects that constantly sense and collect data on our behalf.

5. Experiences are visceral: All of our senses will be engaged as technology blends naturally into our physical experiences. Experiences will connect visual, auditory, and haptic inputs with new, more intuitive user interactions.

At Deutsche Telekom, we will play a fundamental role in this future. At the end of this decade, more and more daily routines will depend on internet access, and users will need connectivity always and everywhere. They will demand a reliable, unlimited, safe and ultra-fast connection and a seamless experience across locations as well as devices. Our role is to provide exactly this.

In combination with this connectivity experience, the exponential development of technology will enable us to build new businesses in the context of artificial intelligence, robotics, or virtual/augmented reality, to name just a few. At the same time we must not forget that the ethics of technology and morality involve challenging questions that require new forums and critical thinking. As Deutsche Telekom, we are committed to our duty to help apply technology for the benefit of society.

Question: To close: You have been DTAG‘s CPIO for about a year now. What targets have you set for yourself personally?

C. v. Reventlow: As Group Innovation+ we have set up a clear framework to help us orchestrate the different innovation initiatives in four areas: Consumer, Business Customer, Processes, and Network. Previously, there were over 20 discrete areas in DT‘s corporate innovation portfolio, which increased the potential for confusion and made it more difficult to communicate the big picture. Our new, simplified framework provides an orchestrating principle both from the customer point of view and the delivery point of view, while at the same time it more clearly highlights the interdependencies between the different innovation areas.

We have also created a new product roadmap delivery process. This roadmap incorporates incremental product innovations demanded and financed by the DT segments (PULL), with a 1-2 years perspective, as well as new initiatives with a 3-5 year delivery cycle that we need to invest in (PUSH). For the latter, we have established a separate fund to ensure appropriate levels of financing beyond yearly planning cycles.

We are also taking a broader perspective, looking at long-term future developments driven by exponential digitization. Here, for example, we are looking at technologies to build a future network with near-to-zero latency and edge computing, as well as potential new business models to compensate for price declines of current services.

With respect to organizational and cultural change, one of my goals as Chief Product & Innovation Officer is the necessary transformation of DT into a customer-centric, "ambidextrous" organization that balances exploitation and experimentation, and manages the tension between the two. Part of this change is the implementation of design-thinking across the company and all of its functions, enabling us to be much more uncompromising when introducing new products and services.

Again, this is all about creating "innovation you can trust." That's not just a slogan. It's a mission, and a cause. We have to deliver innovation that our customers absolutely trust. A company without innovation has no future.

Christian von Reventlow is Chief Product & Innovation Officer (CPIO) at Deutsche Telekom. He studied at TU Berlin and has a doctorate in electrical engineering. He has worked at Siemens, Bosch, Avaya and Intel, among others, and most recently at Nokia subisidiary Here.com. His work will focus on the development of new products and software solutions for the areas of cloud computing, mobile applications and hardware. At Here.com, he supervised the development of the first real-time cloud backbone for high-resolution maps in connected vehicles. At Intel, he was responsible for the software development of the first and second generations of Windows 8 and Android tablets; at Avaya he managed the relaunch of the „Avaya Flare“ videoconferencing solution.

Getting to the Market Fast with Innovations

Swisscom has posted a successful growth story and occupies an excellent position on the market. The company's self-perception as the best companion in the networked world is based on its outstanding mobile and fixed network. Not content to rest on these laurels, Swisscom is planning to advance its development into an integrated technology provider on the basis of the success factors software competence, ecosystems, and partnerships – and quickly introduce innovative solutions to the market **Egon Steinkasserer, Head of Innovation bei Swisscom,** gives a glimpse of future plans.

Interview

Question: 2015 seemed to be the first difficult year for Swisscom because the EBITDA declined by several percent. The days of growth in the core business appear to belong to the past; new growth is nowhere in sight. How do you see the future of Swisscom?

E. Steinkasserer: Swisscom is well prepared to face the future and the challenges that will come with it. Swisscom was able to defend its successful market position in 2015 as well: 59% market share for mobile services, 54% market share for broadband, and 29% market share for digital TV. We were able to post a slight increase in the number of customers as well as in revenues, adjusted for special effects. In the future, our growth will come above all from new digital business areas. Swisscom is already successfully represented in some sectors such as e-health, energy, and smart home. The pillars on which these new growth fields rest, however, will continue to be the outstanding mobile and fixed network at Swisscom, and we will continue to invest in this network.

Question: In an environment of increasing global competition, we see OTTs such as Google offering their own connectivity products such as GoogleFi; manufacturers are putting devices with eSIMs on the market – Microsoft Surface, Apple iPad – that are shaking up the position of operators in terms of the end customer relationship. How is Swisscom responding to these challenges?

E. Steinkasserer: One of the aspects of being the best companion in the networked world is that Swisscom stands for simplicity. We are a trustworthy, inspiring partner for our customers. Advances in the networking of people, things, and data will take us into the information age, but will also confront us with interesting challenges. Just think of data security or the complexity involved in many transformations. We would like to accompany our customers as well as our partners on this journey.

OTTs have added value on a global scale. We know our customers better, we have a local presence, and we can ensure that a digitalized process can ultimately be implemented. Take, for example, our electronic patient file. This information must be absolutely secure, and yet it must be accessible to physicians, hospitals, and patients. It must be possible to connect various IT systems to it.

This is why Swisscom will be transforming itself into an integrated technology provider that develops superior communications and IT solutions for its customers. In our pursuit of this goal, we merged Swisscom IT Services with Swisscom (Schweiz) AG in 2014, enabling us to develop, sell, and operate these complex solutions from a single source. In addition, the beginning of the year saw the establishment of the unit Digital Business, which will focus on this objective.

Question: There have been several examples that illustrate it will not be easy for operators to stand their ground against OTTs in the future even with services. Why, from your point of view, were these operators unsuccessful?

E. Steinkasserer: There are many challenges with which telecommunications operators are struggling in the digital world. OTTs enjoy a software competence that does not exist in this form among network operators. If I were a software hotshot, would I not prefer to work for Google or for a large "infrastructure _operator"? The answer is obvious.

OTTs develop their services very agilely and are willing to accept frequent failures. The quality of their software is not without its detractors, but they have virtually no fear of self-cannibalization. Operators, on the other hand, often act like manufacturers and do not place a product or service on the market until they are absolutely certain that everything is functioning as it should. Our industry does not live a vibrant culture of mistakes. Customers are reluctant to drop even failed or simply obsolete services. Operators do not wish, under any circumstances, to jeopardize their core business with data and voice. These are reasons that hinder many operators from being able to take a stronger position in competition with OTTs.

Question: What success factors does Swisscom need if it is to be able to respond to these challenges?

E. Steinkasserer: Swisscom needs more software competence as well as a flexible, agile, and lean production environment that anyone can use as an aid for the very simple creation of new services. Such services access the Internet, the cloud, and other enabling services such as billing or data analytics with the aid of APIs. If these services are to be agile, it must be possible to introduce them to the market without in-depth integration (fail early/fail cheap). Only later, when they have proved their success, will they be integrated step by step into the official product portfolio until they have been fully assimilated. We are using a new label called "nova" for this purpose so that we can obtain customer feedback for innovative products and services at an early stage.

Moreover, all of the services must lead to an attractive and memorable experience – within the entire ecosystem of the Swisscom services. Such services need not necessarily be linked to our connectivity. Customers should in the future be able to compile a portfolio that ideally serves their specific needs from the range of available services and connectivities.

Partnerships are another success factor; we cannot develop everything ourselves, nor can we do it fast enough. The appropriate strategy and management are the cornerstone of this structure.

Question: And what makes Swisscom different or more successful than other operators?

E. Steinkasserer: We have an outstanding market position in the private and business account sectors. Our linking of IT and telecommunications enables us to develop even complex ICT products and solutions. Swisscom already has at its disposal the broadband network that is an essential prerequisite for digital transformation.

Other factors: the human-centered design is firmly established and has already aided us in a number of cases when we successfully launched new products and services (such as Swisscom TV 2.0) on the market. In addition, we have continuously expanded our software competence; in some areas, our work methods are agile. Moreover, a flexible, cloud-based product development environment is under construction.

Question: By introducing its NATEL infinity rate plans (speed-tiered rates without any volume restrictions), Swisscom offers mobile plans that are the equivalent of a bit pipe. How successful has the introduction of these rate plans been?

E. Steinkasserer: Our idea was to enable customers to move about freely in the digital world and to have access to all of its services. Naturally, this led to strong growth in the data volume in our network. Overall, however, the launch of these rate plans was a success. The most recent expansions into NATEL infinity plus – which de facto eliminates roaming charges – have also generated a highly positive response on the market.

Question: What are Swisscom's own services here that go beyond bit pipe positioning?

E. Steinkasserer: Swisscom offers various services and products that go beyond bit pipe positioning in areas that differ massively from one another. iO is an integrated communications service offered by Swisscom, and Vidia is a video conference app that is not tied to our network. We offer our customers a new, flexible control and security system for the home called SmartLife, and customers can use myCloud, the online storage for photos, videos, and other files, for simple archiving of their personal contents that can be accessed from anywhere at any time. Swisscom eHealth and the i-engineers have concluded a strategic partnership and provide patient file and network solutions for hospitals. The cooperation will create new, cloud-based solutions for hospitals that will be of benefit to physicians and patients as well.

Swisscom and Coop are launching an online marketplace known as Siroop and will contribute their competence in the areas of digitalization, e-commerce, marketing, and retail trade to new companies. Finally, the merger of local.ch and search.ch has created a comprehensive Swiss directory and information platform that is in competition with international providers and offers opportunities in the field of advertising.

Question: How successful are some of the OTT services (such as iO) on the market?

E. Steinkasserer: The dissemination and utilization of iO in Switzerland and the corresponding digital identity are steadily growing. We have our new digital business units that we have established specifically for strategic partnerships and joint ventures to strengthen our market position.

Question: What role will convergence or an integrated network play in the future?

E. Steinkasserer: From a technical perspective, convergence is a “must”, especially in view of the issue of access. We are already offering the first convergent products to our customers: WiFi calling and DSL+LTE bonding. In the future, customers should no longer have to be concerned about what network is being used for what services. These services should also interact with one another and in this way form an ecosystem.

Question: The hype about the Internet of Things is very strong at this time. Will IoT be THE growth driver for telecommunications providers in the future?

E. Steinkasserer: I don’t believe anyone is in a position to make a reliable prediction about this right now. There is certainly a lot of hype, many companies are active in various areas, and the hype extends into a number of different industries. The important point is that a company must set for itself a clear strategic focus so that it can concentrate its resources on potential growth areas. The great challenge for an operator will be to achieve the required added-value depth that will enable realization of a profitable business.

Question: Big data has been the subject of hype for years. How far along is Swisscom here? Is this a Swisscom growth story?

E. Steinkasserer: We have successfully introduced several solutions to the market and have even more ideas and plans in the digital environment. However, we have been compelled to recognize that the full scope of our expectations has not been fulfilled in some areas. We still see huge potential in internal use cases such as the enhancement of a company's own efficiency and improvement in the customer experience.

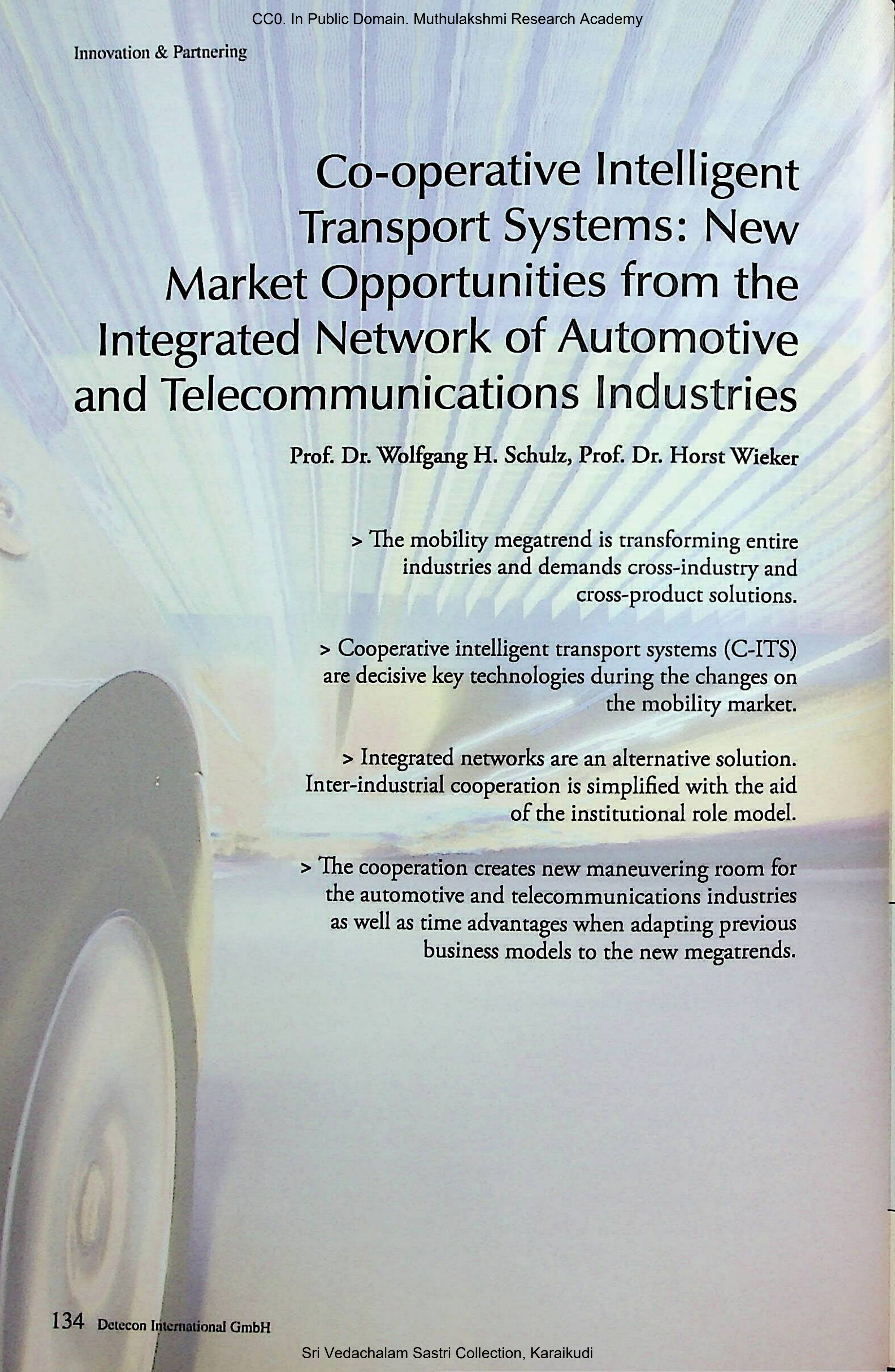
Question: The core business of the OTTs is still advertising. Their success here means they can afford to subsidize other services and, in the future, even infrastructure. Considering the scaling effects of the OTTs alone, can an operator like Swisscom keep up?

E. Steinkasserer: Infrastructure is still highly demanding on resources; it is local and complex. That leads me to believe that OTTs will not be interested in creating and operating their own infrastructure on a broadband market like Switzerland.

Question: What would actually be so terrible about being a "bit pipe" in the future?

E. Steinkasserer: There is nothing at all terrible about it because every network operator today is already a bit pipe to start with and will have to be one in the future as well. It is the starting point and foundation for more in-depth added value. What is more, the most efficient bit pipes have growth potential per se. When all is said and done, data volume is rising steadily. Concepts such as network neutrality, for instance, are based on the hypothesis of a supposedly "infinite" capacity of the transmission channels. And since, as of today, an end to growth in data volume is not in sight, we will also continue to make massive investments in network expansion.

Egon Steinkasserer has been Head of Innovation at Swisscom since the beginning of 2014. He joined the company in 2013 when he became Head of Software Development. He had previously worked for seven years at Würth Phoenix, the software and consulting company of Würth Group, most recently in the position of chief technology officer (CTO). He brings profound knowledge in the development of ERP, CRM, business intelligence, and system management solutions to the job. After earning a degree in computer science at the University of Saarland, Egon Steinkasserer, who was born in Italy in 1972, developed software while holding executive positions at SAP and other companies. ■



Co-operative Intelligent Transport Systems: New Market Opportunities from the Integrated Network of Automotive and Telecommunications Industries

Prof. Dr. Wolfgang H. Schulz, Prof. Dr. Horst Wieker

> The mobility megatrend is transforming entire industries and demands cross-industry and cross-product solutions.

> Cooperative intelligent transport systems (C-ITS) are decisive key technologies during the changes on the mobility market.

> Integrated networks are an alternative solution. Inter-industrial cooperation is simplified with the aid of the institutional role model.

> The cooperation creates new maneuvering room for the automotive and telecommunications industries as well as time advantages when adapting previous business models to the new megatrends.

The automotive industry is one of the key drivers behind Germany's economic power. However, it is under substantial social pressure to ensure that its actions are ecological, economic, and social. Society's demand for a fundamental transformation in the direction of sustainable mobility continues to grow in intensity.[1]

Competitive pressure is the force driving cooperation actions of the automotive and telecommunications industries

Technological product and process innovations have in the past played a decisive role in partially meeting these requirements. In the meantime, however, it has become apparent that transformation must encompass the mobility sector as a whole. This transformation goes beyond the previous advances in technology and requires cross-industry and cross-product solutions if an adequate response to the changes in mobility behavior is to be found.[2]

Intermodal mobility, a turning away from individual car ownership, and new business models such as carsharing are only some of the buzzwords that describe the new aspects of the megatrend mobility. The competitive dynamics that will be seen in the automotive industry in the future can be described perfectly with the help of the methodological analysis framework presented in Figure 1.

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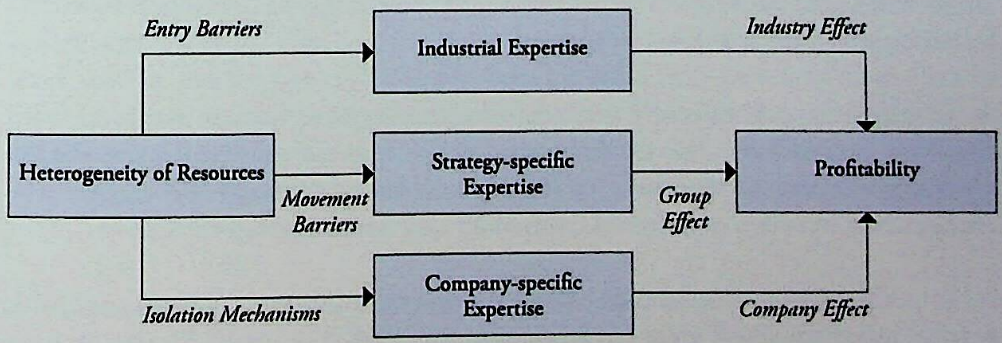
[1] *Cf. Kemp et al., Introduction, in: Geels, Kemp, Lyons, Dudley, Sustainability Transitions in the Automobility Regime and the Need for a New Perspective. Automobility in Transition? A Socio-Technical Analysis of Sustainable Transport, 2012, p. 3-28.*

[2] *Cf Köhler et al., A Transition Model for Sustainable Mobility, in: Ecological economics Volume 68, Issue 12, 2009, p. 2985-2995.*

Figure 1: Competitive Dynamics in the Automotive Industry


Entry Barriers
Industrial Expertise
Industry Effect
Heterogeneity of Resources
Strategy-specific Expertise
Movement Barriers
Group Effect
Profitability
Company-specific Expertise
Isolation Mechanisms
Company Effect

Source: Own presentation based on Schmalensee: Do markets differ much?, in: The American economic review 75(3), 1985, p. 341-351.

The decisive stimulus for competitive pressure comes from the heterogeneity of resources. Competition in the automotive industry has always been characterized by the way carmakers differentiate their positions by means of company-specific expertise such as rear-wheel versus front-wheel drive. This type of intra-industrial competition has dominated. Now new developments such as connectivity, cloud computing, big data analytics, and open data platforms are giving rise to new strategy-specific expertise that can be provided by various stakeholders. Relevant stakeholders are digital companies, telecommunications companies, and startups that have cross-financing potential. Changes in competitive conditions are already becoming noticeable in this area.

Competition within the area of strategy-specific expertise was previously found within the supplier industry; examples are Bosch with ESP and ZF with 8-speed transmissions. As a rule, carmakers were able to exploit this competition among suppliers to increase their own profitability. Now that other stakeholders are becoming relevant for this area, it remains to be seen how profitability in the automotive industry will change. The area of industrial expertise is of the highest relevance for current developments in competition. This is where it will be determined whether the "old industry" – the automotive industry in the sense of all manufacturers as a group – will be able to ward off the market entry of "new industries" – digital companies as well as the telecommunications industry. The successful market entry of "new industries" will, as a rule, have substantial impact on the locations because the agglomeration centers of the "new industries" will win out over the agglomeration centers of the losing industry. Since the management behavior patterns of the new competitors do not have the traditional contextual relationship to the automobile, the impact will be felt on the competitive action parameters of price, quality, capacity, advertising, innovation activities, and R&D investments as well.

Besides this general competitive situation, however, ongoing developments in the following areas must also be considered:

> Competition will intensify because of the market entry of new providers from the BRICS countries. The market entry of German automotive companies on emerging markets in the form of local production facilities will heighten the competition between established companies and newcomers even further.

> Internal competitive pressure from suppliers striving to achieve extensive vertical integration will grow (strategic competition).

> Technological innovations will enable new players from other sectors of industry such as digital companies, telecommunications companies, energy utilities, and financial service providers to enter the market (company-specific competition).

Until now, carmakers have always found ways to block the market entry of potential pursuers from the supplier industry to end production. One example is Magna's failed acquisition of Opel. But the classic strategies for blocking market entry are useless in the case of current and future newcomers such as Tesla and Google because these providers have such power on the market (thanks to their financial strength and the opportunities for refinancing that are available to them) that battle strategies have no effect and cutthroat competition can be avoided only through collaboration. Within the framework of this collaboration strategy, one possible strategy for the automotive industry could be to make use of the communications architecture of the New Economy for ***Co-operative Intelligent Transport Systems*** (C-ist) instead of developing their own communications infrastructure.[3] This means, however, that the automotive industry must cooperate more closely with the appropriately selected competence holders such as the telecommunications industry.

The significance of C-ITS

Cooperative systems and services – cooperative intelligent transport systems, C-ITS for short – are a decisive key technology based on C2X communication. The socio-political acceptance of this technology is high because of the substantial potential for improvement of road safety and transport efficiency. There is a correspondingly high readiness of transport policymakers to support the implementation of C-ITS by making complementary investments in road infrastructure. The cooperative technologies have been defined and tested over the course of many research and development projects. The systems have been tested under actual road traffic conditions in major field trials at both the national level[4] and at the European level.[5] Moreover, results from the simTD project in Germany have verified that general economic benefits can be achieved. The benefits obtained from significantly enhanced road safety alone would lead to economic savings in resources in the amount of eight billion euros a year if broad-area availability were achieved by complete outfitting of all cars and trucks.[6] Along with the road safety effects, however, improvements in transport efficiency are also possible. Transport efficiency effects arise above all from the avoidance of congestion and detours achieved by the optimization of traffic flows. These effects are decisive for productivity-oriented transport, e.g., business trips in cars, and road freight traffic. The primary economic effects would be achieved by the time savings that could be realized and reductions in the amount of travel required. It was possible to demonstrate within the scope of simTD that such savings in Germany could reach a magnitude of four billion euros a year.[7] It must be noted, however, that these efficiency effects from cooperative systems in productivity-oriented road transport would make it possible for companies to realize further savings in transaction costs because the logistics processes can be optimized. Such savings in transaction costs result from improvements in spatial division of labor. Furthermore, both labor and capital productivity can be increased. From an overall economic perspective, these downstream positive effects of cooperative systems are much more decisive because they would strengthen the competitive position of Germany as a location. At this time, however, there are no estimates concerning the magnitude of these overall economic effects of cooperative systems.

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[3] *Cf. Wieker, Fünfrocken, Scholtes, Vogt, Wolniak: "CONVERGE – Future IRS-Infrastructure as open service networks", Presentation, ITS World Congress 2014, Detroit USA, 07.-11.09.2014; Wieker, Fünfrocken, Vogt, Eckert: „CONVERGE – ITS design like Internet", Presentation, 10th ITS European Congress, Finland, Helsinki, 16.-19.06.2014.*

[4] *Sichere Intelligente Mobilität – Testfeld Deutschland: www.simtd.de*

[5] *Zum Beispiel DRIVE C2X: www.drive-c2x.eu/*

This is the backdrop to the decision by road operators in the Netherlands, Germany, and Austria to implement cooperative systems in the road traffic corridor Rotterdam, Frankfurt am Main, and Vienna in the coming years. Direct communication between vehicles, traffic control technology in the roads, and traffic control centers will become possible in the corridor. The first stage will be the introduction of an early warning system for one-day construction sites on the roads. In the second stage, mobility data will be collected so that better traffic management becomes possible. Cooperative systems and services (in Germany, for example) represent an important measure within the national intelligent transport system's (ITS) action plan Road, which is intended to implement the requirements of the European ITS Directive (2010/40/EU). The introduction of cooperative systems and services presumes the cooperation of various stakeholders who have differing tasks and interests. One example is the so-called Amsterdam Group and the CAR 2 CAR Communication Consortium (C2C-CC).

The Amsterdam Group is a cooperation platform serving European road operators (Conference of European Directors of Roads, CEDR), the owners of toll roads (Association Européenne des Concessionaires d'Autoroute et d'Ouvrages à Péages, ASECAP), and selected European cities and regions organized in the network POLIS (www.polisnetwork.eu).

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[6] *Cf. Schulz et al., Entwicklung eines Konzeptes für institutionelle Rollenmodelle als Beitrag zur Einführung kooperativer Systeme im Straßenverkehr. Bundesanstalt für Straßenwesen, 2013.*

[7] *Cf. ebenda.*

The C2C-CC is comprised above all of representatives from industry who are preparing the realization of cooperative systems by establishing technical specifications (standards) and analyzing implementation strategies. At this time, the automotive industry is the dominant player in the C2C-CC, but non-discriminatory membership is basically possible. However, government organizations as well as industry representatives can become members. The Federal Highway Research Institute (BASt), for instance, in its role as public road operator is a member of both the Amsterdam Group and the CAR 2 CAR Communication Consortium. The members of the C2C-CC meet once a year in a joint forum where they exchange information about their current activities and results. In summary, it can be stated that the CAR 2 CAR Communication Consortium institutionalizes the pursuit of a strategy for expanding the scope of communication of vehicles with one another or with the related infrastructure.

The preparation of the implementation of C-ITS has been accelerated by the signing of the Memorandum of Understanding (MoU) of the carmakers for the commencement of the implementation from 2015 and the declaration of intent of the organizations working together under the umbrella of the Amsterdam Group.

Analysis of possible strategies and business models based on the theory of the institutional role models

The level of complexity is very high due to the demanding technical requirements of C-ITS and the necessary networking of a large number of public and private institutions. The traditional forms of cooperation of the past did not offer a suitable starting point for reducing the complexity to such a degree that sustainable and functional business models could be established.

The CONVERGE project[8] has been able to show that non-proprietary solutions among various industries for the implementation of C-ITS are both technologically and economically possible. Moreover, CONVERGE has also been able to demonstrate how non-discriminatory, inter-industrial cooperation for the market launch of a communications platform in conformity with competition law must be prepared. The telecommunications industry was represented by VODAFONE and Ericsson in CONVERGE while Volkswagen, Opel, and BMW took part on behalf of automobile manufacturers. In addition, Bosch attended as representative of the supplier industry. In CONVERGE, the theory of the institutional role models is used instead of the business modeling of the past.[9] Zur Koordination der verschiedenen Akteure mit teilweise unterschiedlichen Interessen verwendet CONVERGE applies the "Institutional Role Model Matrix" (IRMM) for coordination of the various players, whose interests diverge in part. IRMM is an aid for the non-discriminatory and transparent assignment of players and their roles within a networked and complex situation. One objective is to reduce complexity (manageability), another is to identify the players who are most suitable for fulfillment of the technical and economical roles (efficiency). Figure 2 gives an overview of the relationship that exists between roles, players, stakeholders, institutions/individuals, and third parties and that enables achievement of the objectives by means of actions.

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[8] *www.converge-online.de*

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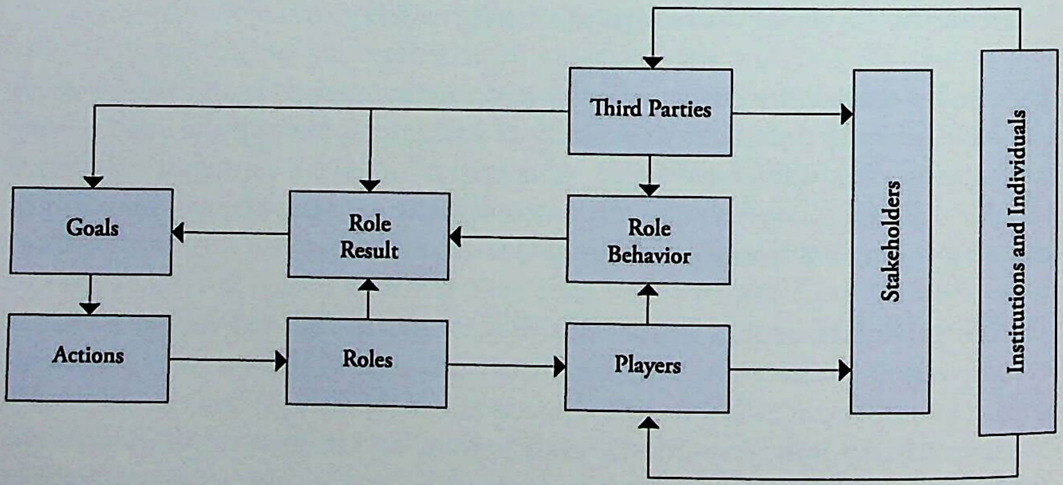
[9] *Cf. Schulz, Institutional economic role models - a new approach for non-discriminatory cooperations, 2011.*

Figure 2: Approach of the Institutional Role Model



Source: Own diagram

The theory of the institutional role model is essentially based on the principles of institution economics [10], system theory [11] and the theory of system dynamics based on industrial economics[12]. The IRM approach was first taken and its concepts evolved within the framework of the research project on the subject of operator models and implementation scenarios for cooperative systems of the Federal Highway Research Institute.[13] The matrix of solution variants for intelligent transport systems in road traffic developed by the Federal Highway Research Institute (BASt) is a part of this conceptual expansion.[14] The CONVERGE project has provided a closed use case for a C-ITS integrated network.[15] A broader application to fundamental issues of the critical infrastructures is carried out.[16]

In a general sense, institutions are understood to mean regulatory systems (rules) and action systems (organizations).[17] As a whole, regulatory systems encompass codes of conduct and customs on markets and in other organizations as components of market and company constitutions along with legal frameworks. Action systems cannot exist without acting persons. This characteristic separates the action system from the regulatory system.[18] A regulatory system, in other words, is an abstract construct of sentences, standards, and conditions. The smallest unit of an action system is an individual; a company is a larger unit.

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[10] *Cf. Schneider, Betriebswirtschaftslehre. 1. Grundlagen, 1995.*

[11] *Cf. Luhmann, Einführung in die Systemtheorie, 2002.*

[12] *Cf. Schulz, Application of System Dynamics to Empirical Industrial Organization – The Effects of the New Toll System, in: Jahrbuch für Wirtschaftswissenschaften/Review of Economics, 2005, p. 205-227.*

[13] *Cf. Schulz, Joisten, Mainka, Volkswirtschafiliche Bewertung: Wirkungen von simTD auf die Verkehrssicherheit und die Verkehrseffizienz, 2013.*

[14] *Cf. Lotz, Herb, Matrix von Loesungsvarianten Intelligenter Verkehrssysteme (IVS) im Strassenverkehr." Berichte der Bundesanstalt fuer Strassenwesen. Unterreihe Fahrzeugtechnik(97), 2014.*

[15] *Cf. Vogt et al., Converge-ITS Communication Architecture for Future Mobility. 20th ITS World Congress, 2013; Schulz et al., Research Joint Ventures as a European Policy Instrument Beneath Directives and Action Plans: Transitions, Interlocking and Permeability of Political, Technological and Economical Requirements, in: Interlocking and Permeability of Political, Technological and Economical Requirements (April 6), 2014.*

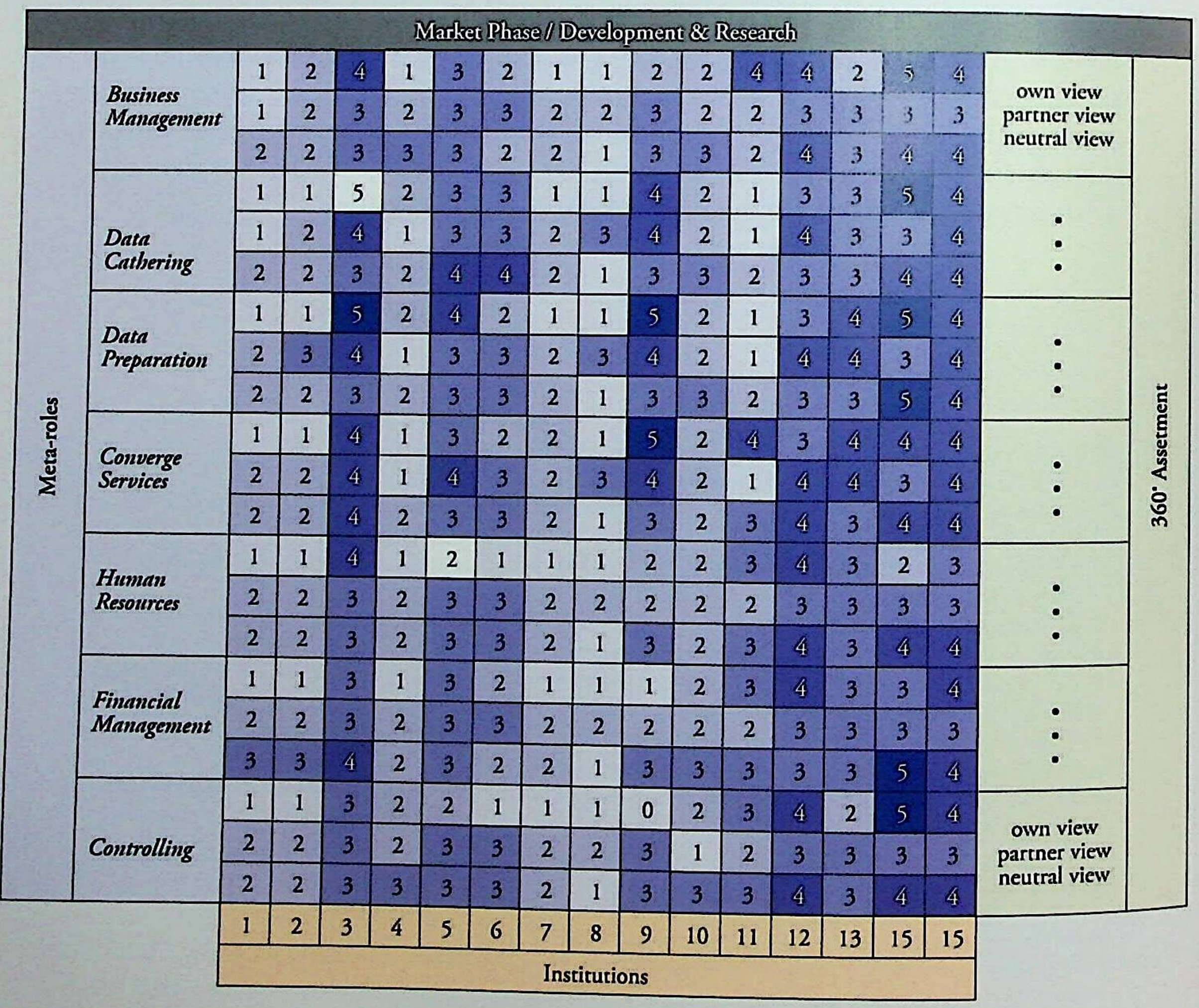
[16] *Cf. Geis et al, Critical Infrastructure: Making It Private or Public–An Institutional Economic Discussion on the Example of Transport Infrastructure, 2015.*

[17] *Cf. . Schneider, Betriebswirtschaftslehre. 1. Grundlagen, 1995*

[18] *Cf. ebenda.*

Figure 3 shows the final IRM matrix for the economic roles. The 15 partners in the CONVERGE project are shown in anonymous form as institutions identified by the numbers from 1 to 15. Each of the partners has defined its preferences regarding role performance. The other partners have expressed their wish with regard to role performance of the other partners. The role performance of each partner is appraised objectively with the aid of an algorithm. This method enables a 360° assessment of all of the partners in terms of their role performance. The intensity of the role performance is shown on a scale of 1 to 5:

Figure 3: IIRM Matrix for the Economic Roles in the Market Phase Development and Research of the Project CONVERGE



Market Phase / Development & Research

Meta-roles		1	2	3	4	5	6	7	8	9	10	11	12	13	15	15	360° Assetment
	Business Management	1	2	4	1	3	2	1	1	2	2	4	4	2	5	4	own view partner view neutral view
		1	2	3	2	3	3	2	2	3	2	2	3	3	3	3	
		2	2	3	3	3	2	2	1	3	3	2	4	3	4	4	
	Data Cathering	1	1	5	2	3	3	1	1	4	2	1	3	3	5	4	• • •
		1	2	4	1	3	3	2	3	4	2	1	4	3	3	4	
		2	2	3	2	4	4	2	1	3	3	2	3	3	4	4	
	Data Preparation	1	1	5	2	4	2	1	1	5	2	1	3	4	5	4	• • •
		2	3	4	1	3	3	2	3	4	2	1	4	4	3	4	
		2	2	3	2	3	3	2	1	3	3	2	3	3	5	4	
	Converge Services	1	1	4	1	3	2	2	1	5	2	4	3	4	4	4	• • •
		2	2	4	1	4	3	2	3	4	2	1	4	4	3	4	
		2	2	4	2	3	3	2	1	3	2	3	4	3	4	4	
	Human Resources	1	1	4	1	2	1	1	1	2	2	3	4	3	2	3	• • •
		2	2	3	2	3	3	2	2	2	2	2	3	3	3	3	
		2	2	3	2	3	3	2	1	3	2	3	4	3	4	4	
	Financial Management	1	1	3	1	3	2	1	1	1	2	3	4	3	3	4	• • •
		2	2	3	2	3	3	2	2	2	2	2	3	3	3	3	
		3	3	4	2	3	2	2	1	3	3	3	3	3	5	4	
	Controlling	1	1	3	2	2	1	1	1	0	2	3	4	2	5	4	own view partner view neutral view
		2	2	3	2	3	3	2	2	3	1	2	3	3	3	3	
		2	2	3	3	3	3	2	1	3	3	3	4	3	4	4	

Institutions

Source: Own diagram

1. Role should not be assumed.

2. Partner could/would assume the role, but it does not have any previous experience in performing this role.

3. Partner could/would assume the role, but it has little previous experience in performing this role.

4. Partner wants to/should assume the role because it has experience in performing the role

5. Partner wants to/should assume the role because the partner has unique selling propositions in this area.

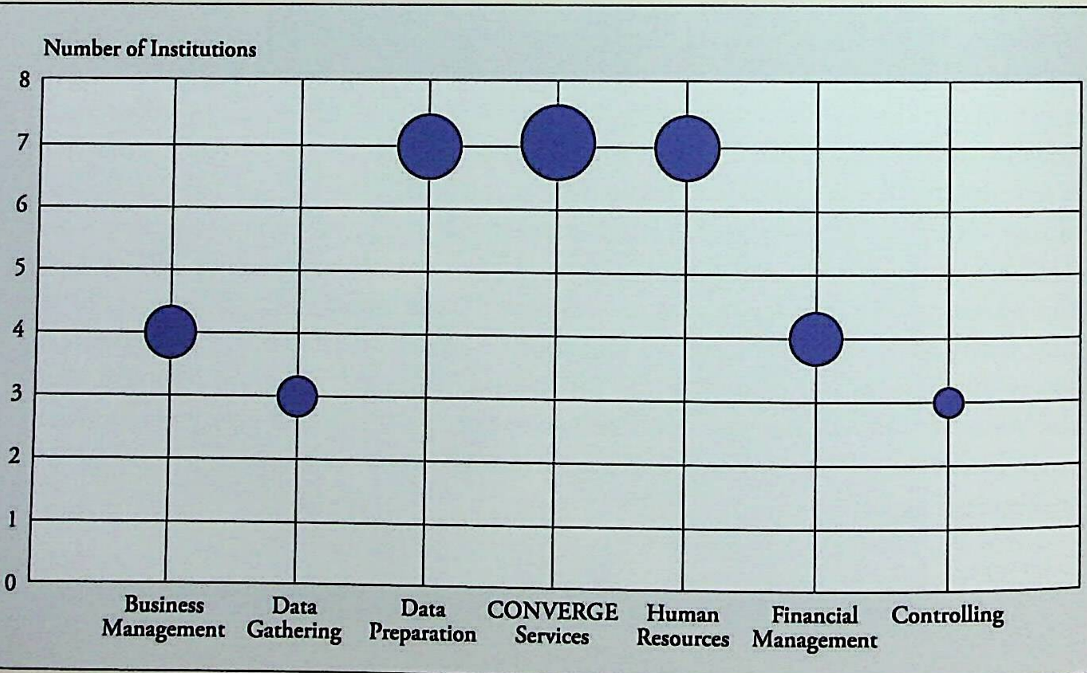
The process of the 360° assessment can be illustrated clearly by an example. Institution "14" ranks its preferences regarding performance of the role "business management" with the value 5. Institution "14" claims that it has the unique selling propositions that make it especially well qualified to perform the role "business management". The other institutions come to an average result, however, indicating the institution "14" has had only limited experience. As a consequence, assumption of the role is assessed on average with a 3. If the average assessment is reached by broad agreement, the variance in total is zero. However, the average assessment can also be the result of an extremely heterogeneous appraisal by the other institutions. The variance in the assessment is a value that is taken into account when the "neutral view", the unbiased assessment of whether a partner is suitable for the assumption of the role, is followed. The neutral view includes, along with the variance in the partner assessment, the variables company size, declared willingness to collaborate in the implementation of CONVERGE, and the technical capabilities of the institution. In our example, the final result is that institution "14" appraises its assumption of the role with a 5, the partners assess the assumption of the role by institution "14" with no more than a 3, and the neutral view comes to the conclusion that the required role performance corresponds to an intensity of 4. The results of the IRM matrix can be transferred to Figure 4 below.

The results based on the diagram are positive for CONVERGE because all of the necessary economic roles can be performed by more than one partner. The size of the group reflects here, taking into account the "neutral view", how trustworthy the readiness of an institution to perform the role is and, at the same time, how accepting the other partners will be of its performance of the role. Figure 4 makes it clear that all of the economic roles can be assumed by partners. The roles "data gathering" and "controlling", however, have an inherent risk that the partners identified as suitable for these roles might in reality refuse to perform the roles. Taking these results as a foundation, it is now possible (because of the enhanced transparency) to conduct subsequent negotiations among the partners within the consortium to ensure that the roles identified as critical are performed by an institution in every single case.

Market opportunities for the telecommunications and automotive industries

The automotive industry is under enormous pressure to adapt and remain competitive because the direction in which its previous business model will develop is not clear. OEMs could themselves turn into suppliers for new mobility

Figure 4: Results of the IRM Matrix



Source: Own diagram

providers. But they could also undergo a transformation into new mobility providers. Cooperative intelligent transport systems (C-ITS) are decisive key technologies during the changes in the mobility market. The successful implementation of C-ITS applications and the powerful dynamics of the technological developments mean that proprietary solutions involve a high risk of loss, possibly even the risk of bankruptcy. In such a setting, integrated networks are an alternative solution.

Inter-industrial cooperation is simplified with the aid of the institutional role model, especially by the introduction as well of technical roles that obey the principles of the Internet. This lowers the market entry barriers to the market for C-ITS significantly for the telecommunications industry (as one example). Moreover, the creation of a transparent institutional role model can establish a fair distribution mechanism among the various players so that sustainable cooperation projects and service products can appear. No-holds-barred cutthroat competition can be avoided, but the competition in quality is intensified. Furthermore, room for financial maneuvering is created for competition using technological innovations. Cooperation with the aid of the institutional role model gives rise to greater space for action as well as time advantages for the realignment of their previous business models to match the new megatrends for both the automotive and the telecommunications industries.

Prof. Dr. Wolfgang H. Schulz is a professor and, since March 2014, the holder of the Chair of Mobility, Trade, and Logistics as well as director of the Amadeus Center for Mobility Studies at Zeppelin University. The research and work of the Chair of Mobility, Trade, and Logistics focus on new mobility concepts and solutions. New theoretical ideas are applied to produce rewarding concepts for business practice that, above all, also generate general social benefits. The Center for Mobility Studies located at Zeppelin University is committed to the interdisciplinary, intersectoral, and international analysis of the regulatory, ecological, economic, cultural, or planning framework conditions of innovative business models in the mobility sector. The aim of the work at the institute includes the analysis, development, and evaluation of innovative mobility concepts. Supplementing the traditional methods of industrial economics and cost-benefit analysis, the theory of institutional role models developed by Dr. Schulz, professor and holder of the chair, is a unique selling proposition in the landscape of international research. The theory of institutional role models has been used for the business modeling of integrated networks, communications platforms, and electro-mobility solutions as well as in political consulting for the introduction of complex technologies.

Prof. Dr. Horst Wieker is Professor of Telecommunications and Head of Research for Traffic Telematics at the University of Applied Sciences of the Saarland. He studied and obtained a PhD in Communications Engineering at the University of Bremen in 1991. Thereafter he worked at Siemens in the area of hardware and software development for switching units controlled by microprocessors. His research interests are in the system design of communication networks and in traffic telematics. In 2000 Horst Wieker founded the EuroTec Solutions GmbH as an AT Institute of the HTWsaar. He is active in many research projects, e.g. Prevent Willwarn, CVIS, AKTIV, SIM-TD, Urban or CONVERGE.

■

Smart Business Networks in the Telecommunications Industry: Partnering Excellence is Critical for Success

Dr. Christian Krämer

> Partnering excellence is becoming a critical factor for success.

> A Detecon study provides transparency about partnering maturity in the telecommunications industry.

> Telecommunications companies are already using partnerships as a weapon for growth.

> Many telecommunications companies still have plenty of potential for development of the key factors for successful partnership management determined by the study.

Telecommunications companies have set out on a digital course of growth that includes cooperation projects and active partnering. The initial results from an international partnering study give some indication of how far the partnering maturity of telecommunications companies has advanced – and the extent to which they are capable of steering complex integrated systems as well.

The role of smart business networks as the drivers of trans-industry cooperation

The article entitled "Cooperative Intelligent Transport Systems" in this book[1] describes the importance of trans-industry cooperation projects for Industrial Revolution 4.0. Traditional sectors such as the automotive industry are driving the transformation of the mobility sector with the aid of new digital developments such as connected car, cloud computing, or big data analytics. They are taking advantage of what many different partners can offer them. Connected car is one example: in this case, telecommunications companies are a key partner because they can provide the required connectivity as well as many and varied services – remote maintenance, driver assistance, information.

OEMs and telecommunications companies are acting within a framework of further partners such as established automotive suppliers, service providers such as Deutsche Bahn, Lufthansa, ADAC, insurance companies, or application/ OTT providers such as Google. Entire added-value chains crossing multiple industrial boundaries are caught up in transformation with the aim of offering new solutions. Key capabilities within an integrated system are secured by the creation of a partner network. The overall issue here is the handling of smart business networks, i.e., trans-industry alliances comprising multiple partners from many different industries and technology contexts.

A smart business network is an alliance of companies that provides a joint business model for a service or a product encompassing a number of added-value stages in coordinated logic to the consumer.[2]

The model of the smart business networks[3] is characterized by closely connected business models among various partners, a high degree of flexibility in fast connect and disconnect, an automated flow of processes ("Vision Plug & Play"), and a coordinated approach analogous to an operating system. Examples of such networks are the distribution network of Li and Fung that orchestrates 15,000 suppliers and 8,000 sales agents worldwide without requiring major capital investment[4] or Multiassistencia, a Spanish insurance company that relies on policyholders in conjunction with maintenance and repair networks and carmakers for the handling of claims adjustments.[5]

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[1] *Cf. Schulz, Co-operative Intelligent Transport Systems, p. 138 in this book.*

[2] *Cf. Münchener Kreis, Vortragsband Smart Business Networks, 2012 München.*

[3] *Cf. Heck, Vervest, Communication of the ACM - Smart Business Networks, Communication Magazine, Vol 50, Issue 6, Netherland 2007.*

Partnering excellence is critical for the success of the effective steering of these business networks. Our thesis is that companies with the most highly developed partnering capability will take over the leadership in the partner ecosystems and be able to realize the corresponding economic impact.

Detecon partnering study: focus on telecommunications and ICT companies

Detecon has launched an international study on partnering with the objective of obtaining greater transparency about the partnering maturity of the telecommunications industry. The study focuses on the following questions:

1. How pronounced are the partnership capabilities of telecommunications companies?

2. How high is the degree of ambition associated with partnership initiatives?

3. What are the most important success factors for improvement of cooperation projects?

The study is intended to serve as an aid to strategists, business developers, and managing directors whose responsibilities encompass partnering activities. Faithful to the slogan “Learn from the Best!”, interviews are being conducted with professionals from leading telecommunications and ICT companies (among them Deutsche Telekom, Telefónica, Orange, and Telenor), asking them about their cooperation activities. The study will continue until the end of 2016. Some initial results from the starting sample (n = 15) have been summarized in the following. There is sufficient data to allow us to map the degree of motivation related to cooperation projects in the telecommunications industry and to give an indication of what “backing” cooperating industries such as the automotive industry, health care, or energy provision can expect from the telecommunications industry.

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[4] *www.lifung.com*

[5] *Cf. ESADE Case Study Multiassistencia on the Internet, 2016, S.12.*

Relevance of partnering in the telecommunications industry

One important element for the performance of cooperative integrated systems is the commitment that the partners bring to the table in the cooperation project. This commitment is very strongly anchored in the telecommunications industry.

A look at the top box values alone in Figure 1 (significance rating 4 and 5) shows that over the last three years partnering has become substantially more significant for 87% of the surveyed telecommunications companies. And 73% of the respondents estimate in the forecast that partnering will in the future become "much more important" for corporate strategy while 23% opine that the "tendency" will be toward "greater importance".

These results are congruent with the observations of Ovum Research.[6] Significant growth in digital partnerships is observed in the areas of machine-to-machine and partnering with over-the-top (OTT) players such as Google, Deezer, or Facebook. This goes hand in hand with a massive build-up of capabilities for the development of platforms: in 2015 alone, Ovum Research registered 328

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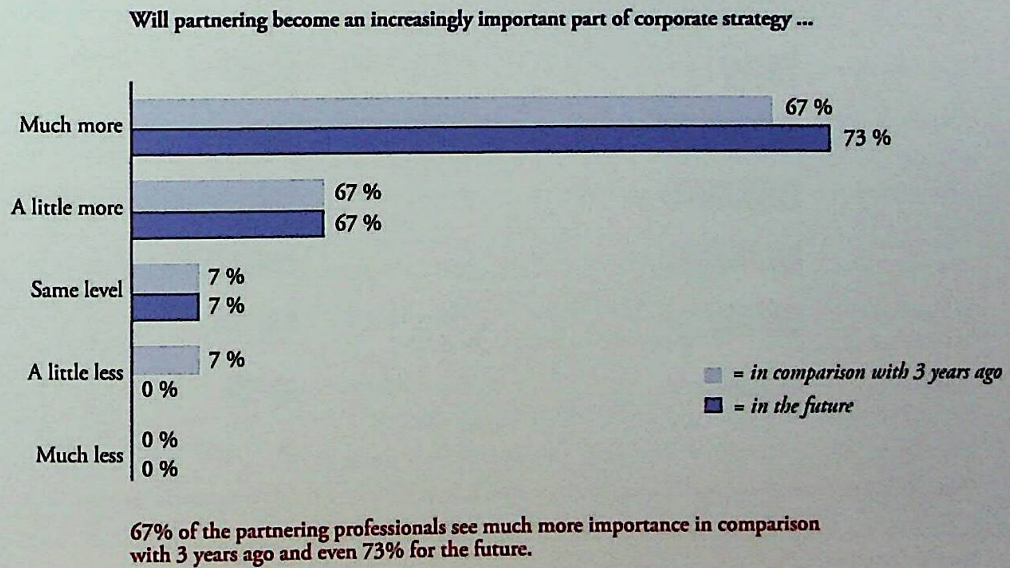
[6] *Cf. Ovum Deal Tracker Machine-to-Machine and IOT Contracts Tracker 3Q, 2015; Ovum Deal Tracker Telco-OTT Partnerships Tracker 2Q, 2015, 2016.*

Figure 1: Relevance of Partnering in the Telecommunications Industry



Source: Detecon

cooperation deals between telcos and OTTs. Moreover, carriers have been involved in more than 80 IT projects and invested substantial sums in M2M and Internet of Things platforms since 2009. These activities are intended to achieve a broad range of links to partners within the framework of smart business networks. 80% of the platforms decisive for the partner networks – IT systems and cloud applications above all – have been acquired by the telecommunications companies in the last four years.

Motivation a decisive variable

The institutional role model developed by Professor Schulz[7] points to the expectations and motivations of the players as decisive variables for the success of the integrated system. If we look at the motives of the telecommunications industry, we see the following profile (see Figure 2).

According to this profile, the most important motivation for entering partnerships for 80% of the surveyed telco professionals is to increase revenues and

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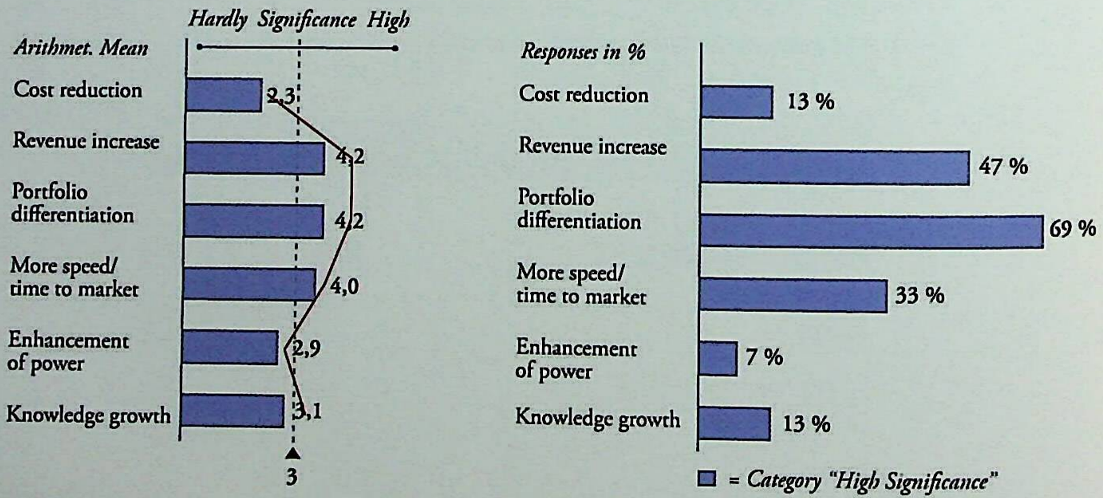
[7] *Cf. Schulz, Co-operative Intelligent Transport Systems, p. 138 in this book.*

Figure 2: Drivers to Cooperation for the Telecommunications Industry

The primary motives for partnering at telco companies are ...



Portfolio differentiation and portfolio expansion as well as increase in revenue are the primary drivers.

Source: Detecon

to achieve differentiation by means of a portfolio expansion. The direction of growth differs in specific points. The expansion of the portfolio strives for differentiation through innovations and new added-value services. The increase in revenues through cooperation projects, on the other hand, is aimed more at the entry onto new markets and internationalization. Acceleration of the time-to-market follows very closely. The realization of cost savings, in contrast, turns out to be of surprisingly low significance.

In sum, partnerships are a growth weapon for a communications industry that has as a tendency reached a level of maturity.

Cooperation focal points in generating added value

The respondents cast a clear vote on the question about the parts of the added-value chain in which especially active use of partnerships occurs.

According to 38%, the sector of sales and marketing is supported in this way, both nationally and, for international sales, in addressing new channels and distribution means.

Cooperation projects are carried out specifically in the field of innovation for 32% of the respondents, whether for the purpose of driving forward the development of content, technology, or products or of generating new added-value services. The third-most intense area of cooperation activities (for 18%) is in service, maintenance and infrastructure where, for example, cooperation partnerships related to platforms or mobile network equipment are found.

The significance of the types of partnerships is distributed along these lines as well. The field is led by innovation partnerships, followed closely by distribution and marketing partnerships. Service partnerships appear in third place. The purchasing sector featuring purchasing partnerships for improvement of the negotiating position with respect to suppliers has a ranking of 20% and plays a rather subordinate role. Multiple answers indicate that partnerships in the surveyed companies are used in at least two areas of added-value generation.

These findings also document the strong emphasis on growth from cooperation projects in the telecommunications industry. Motives related to increases in efficiency are secondary.

Level of ambition

The level of ambition and the integration of the partner strategy into the corporate strategy are important indicators of the determination with which telecommunications companies enter into cooperation ventures. The picture here is mixed.

While top box values show that 67% of the surveyed companies follow a strategic and long-term approach, 60% of the surveyed companies nevertheless make use of partnerships as "stopgap measures" – i.e., they are opportunistic.

Still, a high level of commitment must be assumed because two-thirds of the respondents attribute high significance to partnering governance – rules, processes, and organizational structures – in their partnership strategy. This is a good foundation for integrated systems because the collaboration must follow agreed rules for action here.

In the ideal case of a smart business network, companies should work together "with the coordination of an operating system."

Partner management

The capability to take over a leadership role in a cooperation network – we call it the "channel captain role" – is to an essential degree dependent on the skills in managing partners. Our forecast projects that active value chains do not tend to develop as self-regulating systems; instead, top players who have the ability to steer value chains in a competitive environment, to attract partners, to motivate, and to secure the general conditions resulting in genuine win-win situations for their members begin to stand out.

Companies with strong brands and excellent knowledge of the market, good partnering expertise, and far-sighted network design character and dynamic perspectives ("agile view") will have the best chance to take over the role of the channel captain.

The combined observations of various leadership and partner care dimensions produce the following picture (Figure 3): when it comes to the leadership claim, 67% of the companies see themselves as the senior partners in an association.

However, whether companies understand their roles more as senior partners, knowledge leaders, or junior partners depends on the size of their counterparts as well – think of Microsoft or Google, for example. All the same, one-third of the companies view themselves either as knowledge leaders (21%) or clearly as junior partners (14%).

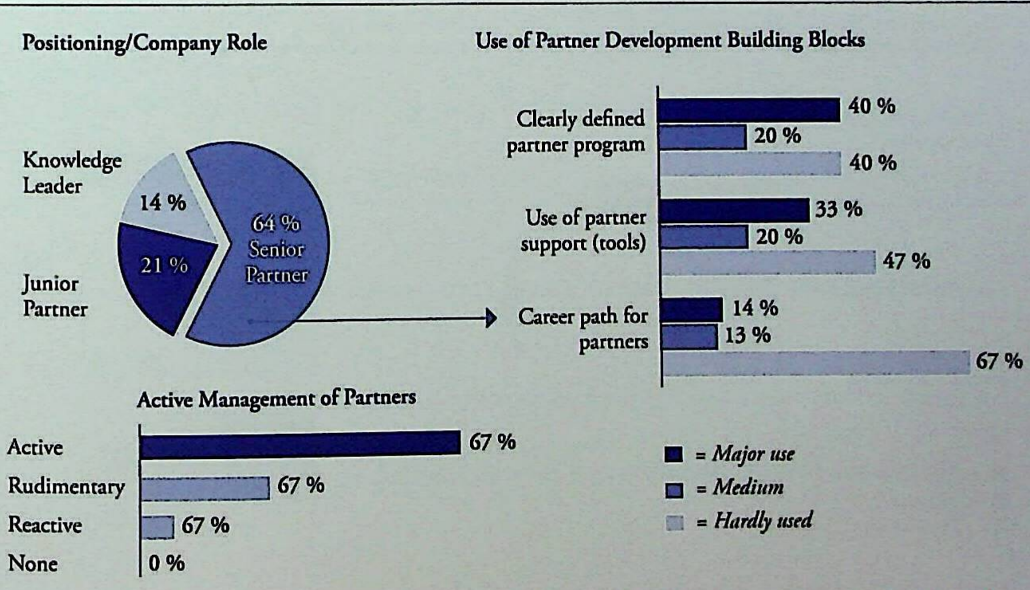
Two-thirds of the companies actively manage their partners, so only one-third of the companies steer partners rudimentarily or reactively. If we look at specific instruments, however, this picture begins to erode a little: according to the top box values, only 40% state that they have a clearly defined partnership program. Only 33% offer partner-related support tools, and no more than 14% offer a career path to their partners ("from bronze to gold partner").

If we recall that the partner is a major driver of revenues, there is potential for improvement here.

Experience in complex partnership systems

Within the value-added chain, we run more and more frequently into sub-alliances and economic associations. The competitive environment is changing – and not only in the telecommunications industry – from one of competition among single companies to one among value chains. The management of the

Figure 3: Partner Management



2/3 of surveyed companies actively manage their partners. But only 1/3 offer active support via tools and merely 14% clearly state that they provide a career path "from bronze to gold partner" to their partner.

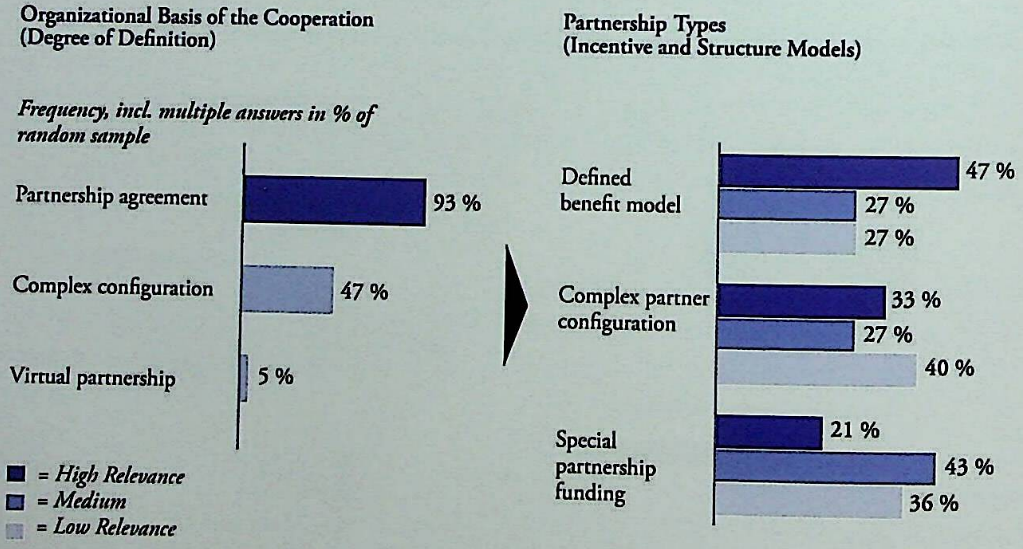
Source: Detecon

value chain with defined players from the industry and specialists in the partner portfolio determines the unique selling propositions of the product line and the potential for returns. The picture that emerges from this survey is still quite conventional (Figure 4).

93% of the respondents conduct their cooperation activities on the basis of a partnership agreement. Only 47% (multiple answers possible) have had experience with more complex configurations such as joint ventures, strategic alliances, or a smart business network.

By and large, the partnership model in terms of the incentive and structure model is also kept simple. The impression is that most of the activities revolve around revenue sharing or purchase price advantage models, forms that are typical and practical in one-to-one partnerships in a dual cooperation project. Models of these types are important for 47%. In contrast, complex configuration models such as international mobile roaming or multi-partner alliances are of great importance for only one-third of the respondents. Special funding for innovation and incubation models is relevant for a mere 14% of the respondents.

Figure 4: Smart Business Capability



Organizational Basis of the Cooperation (Degree of Definition)

Partnership Types (Incentive and Structure Models)

Although the digital revolution encourages partnering, the cooperation is rarely based on virtual connections. The majority use defined benefit models (e.g., revenue sharing) and secure the cooperation with agreements.

Source: Detecon

In other words, actual practice in telecommunications companies is still quite far removed from the "alliance paradigm" of highly-networked business models with multiple partners and closely coordinated activities analogous to an operating system.

One highly promising development is the ICT alliance involving the greenfield company Ngena[8] a spin-off of T-Systems. Ngena is a global alliance of service providers, based on the sharing economy concept, with the technology partner Cisco. Alliance partners on the service provider side are CenturyLink, Deutsche Telekom, Reliance Jio, and SK Telecom. The alliance partners provide (local) network services; Ngena serves as the "hub" and ties together the connections to the benefit of business customers worldwide. Over 20 more service providers are expected to join the alliance to make this a high-performance smart business network of global scale.

Success factors of partnership management

Even though the research into success factors that is the subject of the Detecon study has not yet been concluded[9] it has already become possible to recognize four key factors[10] that have a positive effect on the success of partnerships.

Factor 1:
An inspiring, coordinated, and effective partner strategy

Typical check questions:

> Does the partnership strategy make any contributions at all to the corporate strategy?

> Is it clearly anchored in the joint business plans of the cooperation partners?

Factor 2:
Professional selection of the partners to create a convincing partner portfolio

Typical check questions:

> Have we looked for and acquired top players from the target markets and industries?

> Did we pay attention to the best fit with our company when selecting the partners?

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[8] *www.ngena.net*

[9] *Publication of results at the end of 2016.*

[10] *Cf. Krämer, Neven, Partnering 2.0: Bringing Out the Best in Your Partners, in: Detecon Management Report 2/2015, Köln 2015, p. 14-18.*

Factor 3: Automated partner processes at "excellence level"

Typical check questions:

> Have the partners been linked to our company through automated technical and commercial processes?
> Is the upscaling of a partnership as effortlessly possible as a quick disconnect if necessary?

Factor 4: Attractive partner development that initiates additional growth

Typical check questions:

> Are we developing partners from bronze to gold partners on a merit basis?
> Is the partner program flanked by support measures such as a partner portal or relationship management?

These factors are decisive for the success of cooperation projects. They are equally critical for the success of every type of partnership. Nevertheless, the weighting of the factors to assure success can vary according to the type of partnership. For instance, the selection of partners for distribution partnerships is decided in particular by the revenue potential that is to be addressed. Conversely, automated processes of the "Plug & Play" type are imminently important for service partnerships. Process breaks or a high proportion of manual work in service delivery will otherwise lead to enormous costs for provision of the service when scaling is at a high level.

One striking point of the survey was a clear gap between the level of ambition – "more revenue or more profit through cooperation activities" – and the degree of excellence of the partnering instruments used. The expressed target was frequently to increase significantly the revenue share from partnering in the observed business unit (e.g., from 2% to 10%) and to provide a substantial contribution to the EBITDA. But the context of the process landscape was characterized by workarounds and high levels of manual work that prevented high scalability at acceptable cost. Highly automated partner processes tend to be the exception rather than the rule in telecommunications companies. Consequently, the companies must close major gaps in their operational partner management so that they can fully exploit the economic potential of partnering.

Well on the way to excellence

Telecommunications companies have recognized the significance of partnering in digital transformation. Partnering is right at the top of their strategic agenda as a growth weapon to increase revenues and achieve differentiation. Accordingly, they are working on the enhancement of their partnership capability. Nevertheless, they face the challenge of expanding the original, dual one-to-one partnerships and finding their place in trans-industry integrated systems – in no small part a consequence as well of the competition from the large OTT players Google, Facebook, and the rest or from the ultra-flexible startups like Spotify or Netflix.

Two works in progress are critical for the success of the "win with partners" approach: the ability to build, lead, and mold smart business networks and the perfecting of operational partner management with respect to customer-centric "Plug & Play". ■

The Unbalanced Regulation of Telecom Markets and OTTs in Europe and the Impact on Network Operators

Martin Lundborg

- The sector specific regulation of dominant telecommunication providers has been limited to fewer markets but remains intense for internet access offerings.

- Additional net neutrality regulation is imposed on all telecommunication providers regulating their coexistence with the OTT players.

- The telecommunications regulation establishes an unleveled playing field, especially limiting the chances for telecommunication providers to compete with OTT players in the internet access markets.

The telecommunication providers are regulated in the EU by sector specific regulation. This has led to an unleveled playing field for telecommunication providers when these compete against OTT (Over-the-top) players offering similar services. In this article, we look at the unbalanced regulation and the outcomes on telecommunication providers.

Unbalanced legal/regulatory framework

The reasons for the unleveled playing field are manifold:

> Asymmetric sector specific regulation is imposed on dominant telecommunications providers (also referred to as SMP, Significant Market Power regulation), according to which the dominant players are forced to offer certain (wholesale) products/services at regulated prices and on a non-discriminatory basis. The SMP regulation is mainly based on a regulatory toolbox of six standard obligations which are normally imposed on providers in four main telecommunication markets (access markets and interconnection). Details are included in the section "Sector specific regulation of dominant telecommunication providers" below.

> In 2015, it was decided by the EU parliament and council to amend the sector specific regulation of dominant players with the net neutrality regulation, limiting all telecommunications networks providers in offering internet services. This regulation has the aim to reduce the abilities for telecommunications providers to offer services with premium customer experiences compared to services offered over the "open internet" (e.g. "OTT services"). The section "Net neutrality within the EU" outlines the details of this regulation within the EU.

> Sector-specific consumer protection and universal service obligations are parts of the European regulatory framework imposed on telecommunications providers but not on OTT players. Inter alia, the telecommunications providers are limited in the way they offer their services (e.g. maximum contract durations), have to inform their end-users about consumer rights and obligations and might be forced to offer their services in unprofitable areas (universal service obligations).

> The telecommunications providers have to oblige to national tax laws and regulations in each specific country in which they offer their services, while the OTT players offer their services internationally and thereby have the possibility

to optimize the burden of taxes and fees by choosing where the revenues and corporate profits are subject to tax payments.

> Data protection regulation within the EU imposes obligations on telecommunications providers which limits their ability to "sell data" as a part of the business model. Instead of enabling data as a revenue source, the data retention regulation imposes additional costs on telecommunications providers.

The outcomes is an unbalanced regulation of telecommunication providers as e.g. both the sector specific regulation as well as the net neutrality regulation is aiming at the telecommunication operators only.

The next section covers the sector specific regulation of dominant telecommunication providers, including underlying trends. This is followed by an overview of the net neutrality regulation within the EU and the last chapter covers the outcomes on telecommunication providers.

Sector specific regulation of dominant telecommunication providers

The telecommunication sector is subject to specific regulation of the dominant providers, additional to the common competition laws implied throughout the entire economy. The aim is to facilitate competition in the markets by preventing network operators from anti-competitive behavior at the expense of other telecommunication providers and consumers. This regulation, also referred to as sector specific regulation of operators with SMP (significant market power), includes e.g. tariff regulation and access regulation.

The products and services subject to this regulation within the EU has changed over the years. During the 1990s it was decided in Europe to break-up the telecommunications monopolies in Europe by introducing sector specific regulation. Based on the EU regulatory package in 2002 (updated in 2009), it was decided that regulatory authorities shall conduct market reviews (based on the three criteria test) in order to determine which telecommunication markets to regulate. For the regulated markets, the regulatory authority shall design one or several providers as having SMP. For the SMP operators, the regulators have a standard toolbox including certain obligations which can be imposed on SMP providers:

> Access obligations, i.e. the requirement to provide (wholesale) services;

> Price regulation, e.g. obligation to offer prices which shall be cost oriented or reasonable;

- > Transparency obligations, including obligations to publish regulated (wholesale) standard offers, publication of prices and contractual conditions as well as network information;

- > Non-discrimination obligations, implying that all customers of the SMP operator shall be treated on equal terms;

- > Cost accounting obligations/accounting separation obligations requiring the SMP operator to provide financial transparency, e.g. in order to identify prices which are below costs (cross-subsidization);

- > Structural/functional separation obligations, i.e. that the (wholesale) business units are separated from other (retail) business units.

The EU has issued a recommendation on which markets to regulate with sector specific regulation in 02/2003, updated 12/2007 and 10/2014. While the first recommendation in 2003 contained 18 retail and wholesale telecommunication markets, the latest contained only four wholesale markets and no retail markets.

The removal of the retail markets is based on the presumption that the wholesale regulation is sufficient to facilitate competition in downstream retail markets.

Fugure 1: Regulated markets according to EU market recommendation of 2014

	FIXED	MOBILE
Retail Market (Access and Voice calls)	STOP *No regulation*	STOP *No regulation*
Wholesale call origination	STOP *No regulation*	STOP *No regulation*
Wholesale call Termination	GO! *Susceptible for regulation*	GO! *Susceptible for regulation*
Leased Lines (trunk and terminating segment)	GO! *Susceptible for regulation*	STOP *No regulation*
Wholesale access (LLU/BSA)	GO! *Susceptible for regulation*	STOP *No regulation*

Source: Detecon

Compared to the previous recommendations, also the wholesale call origination markets and the call transit markets have been deemed to not require sector specific regulation. The reason for this lies in the development of alternative operators in the fixed access markets as well as OTT (over-the-top) substitutions (e.g. VoIP, such as Skype or Apple Facetime).

The market for mobile call origination and the market for wholesale international roaming have been removed from the list as the regulation of these were hardly implemented by national regulators in the past. Of the remaining markets susceptible to regulation, two refers to call termination and two refers to fixed access, as described below:

Market 1 "Wholesale call termination on individual public telephone networks provided at a fixed location":

> The market 1 refers to interconnection in the form of call termination on fixed networks. This is the wholesale service bought by telecommunication providers in order to provide calls from the own customers to customers on other fixed networks.

> Based on the current regulation (which defines each network to be an own submarket) all telecommunication operators have SMP and are regulated.

> The regulation in this market typically includes the tariff regulation ("fixed termination rates") and access/transparency obligations including the implementation of reference interconnection offers.

Market 2 "Wholesale voice call termination on individual mobile networks":

> The second market is similar to market one but refers to the mobile termination, hence, the EU still delineates between fixed and mobile networks in spite of fixed mobile convergence.

Market 3a "Wholesale local access provided at a fixed location" and 3b "Wholesale central access provided at a fixed location for mass-market products":

> The third market includes the fixed access, i.e. the last mile implemented to provide telecommunication services (voice and internet) to residential and corporate customers.

> The market 3 has been divided in 2 sub-markets. Market 3a is similar to the former market 4 for LLU – local loop unbundling (according to 2007 recommendation), i.e. the access lines between the end users and the first exchange. In addition to the former market 4, the new market 3a also includes bitstream access offerings with a short backhaul (also referred to as VULA – virtual unbundled local loop). The reason for the changed definition is the roll-out of NGA networks (FTTx) and the diminishing boundaries between WBA (Wholesale broadband/bitstream access) and LLU (local loop unbundling) as a result of this roll-out.

> Technologies typically included in market 3a are copper and fibre access (FTTx), but in some countries also further provisioning for duct access, collocation etc. are common. The wholesale offers included in the market are local WBA, LLU, sub-loop unbundling and virtual unbundling.

> The market 3b includes the fixed access markets not included in the market 3a, predominantly wholesale broadband/bitstream access, i.e. comparable to the former market 5 in the 2007 recommendation.

Market 4: "Wholesale high-quality access provided at a fixed location":

> The market 4 refers to the market for wholesale point-to-point (or point-to-multipoint) connections, also referred to as leased lines or managed services. The market mainly addresses wholesale inputs for business/corporate customers. Relevant technologies are SDH/PDH and Ethernet.

Since the new recommendation has been published in 2014, several regulators have conducted market analysis and notified these. These assessments give insights into the critical relevant issues which the regulators are currently dealing with. The following table shows key results of the most interesting market analysis notifications.

As can be seen in the table, relevant issues according to national regulators to deal with are e.g. the inclusion of MVNOs in market 2 and CATV operators in market 3 (a/b) and the exclusion of certain bandwidths in market 4.

Several national regulators have also decided to continue regulating markets not included in the market recommendation. These include e.g. the SMS termination market in France, the retail markets in Ireland and the inhouse/drop cable for FTTH (France).

Based on the new market recommendation published in 2014 and the market assessments conducted by the regulatory authorities within the EU, it becomes clear that the regulatory scope is being reduced over time. The number of markets susceptible to ex-ante regulation according to the market recommendation has been reduced from 18 in 2003 to 4 in 2014, removing regulation of retail markets, call origination and broadcasting transmission. In the recent recommendation only the markets for (1) Fixed call termination, (2) Mobile call termination, (3) Fixed access and (4) leased lines/managed services are deemed as necessary to regulate based on the SMP regime.

The roll-out of alternative infrastructures (CATV) and platforms (OTT) is one of the arguments for less regulation in the next coming 10 years (both access and voice services). Another argument for less regulation in fixed access markets is the effective regulation and the increasingly interlinked markets, meaning that the successful regulation of one market motivates the removal of sector specific regulation in another market (e.g. market 3a and 3b).

Figure 2: Selected Notifications in the EU

LAND	MARKET	LESSONS LEARNED/KEY ISSUES
UK, Italy	• Market 2: Mobile call termination	• Include full MVNOs and designate a large number of MVNOs as SMP operators
France	• Market 2: Mobile call termination	• Regulation of SMS termination in spite of evolving OTTs
Ireland	• Former market 2 (2007 rec.): Fixed retail markets	• Remaining ex-ante regulation for retail fixed markets based on national conditions
Netherlands	• Market 3a: Wholesale local access	• Including CATV operators in the relevant markets
Sweden	• Market 3b: Wholesale broadband/bitstream access	• Regulation of market 3b can be removed due to national conditions in market 3a
France	• Additional market: FTTH inhouse/drop cabling	• Additional markets can be defined for FTTH deployment
Poland	• Market 4: Leased lines	• Leased lines sub-markets based on bandwidths and transitional rules for removal of regulation
Finland	• Former market 18 (2003 rec.): Broadcasting transmission	• Additional markets for broadcasting transmission can be regulated based on national conditions

Source: Detecon

Another trend which has been going on for a decade is the fixed-mobile-convergence. Currently, this is driven by the LTE (and VoLTE) roll-out which might remove the barriers between fixed and mobile networks, possibly leading to less regulated markets in the future. This is relevant for the call termination markets (fixed and mobile) as well as for the fixed access markets (market 3a/b). Due to increases in the "bandwidth and data hunger" of the consumers, the impact of fixed mobile convergence on the market 3a/b is less likely though as the enhanced capacity of fixed networks is required to fulfill end users needs.

In spite of reduced regulatory scope and the arguments for less regulation, the most powerful regulation of the fixed access markets, i.e. the regulation of market 3a (LLU) is going to remain at current levels. This implies that the regulation of the fixed telecommunication markets will continue to play an important role to the entire sector. Hence, while fewer markets are regulated, the sector specific regulation remains powerful.

Net neutrality within the EU

The EU has decided to amend the sector specific regulation above by net neutrality regulation facilitating an "open internet", which regulates all telecommunication providers offering internet services and not only the dominant players. This net neutrality regulation introduces a regulation of the relationship between the telecommunication providers and the OTT players such as Google, Facebook/WhatsApp, Apple and Microsoft/Skype, Spotify etc.

The legislative changes decided by the EU include amendments of Art. 8(4) of the framework directive, Art. 20-21 and 22(3) of the Universal service directive as well as Art. 5 of the ePrivacy Directive. Based on the changes the national regulatory authorities (e.g. BNetzA in Germany and OFCOM in UK) shall contribute to the development of the internal market by promoting the ability of end-users to access and distribute information or run applications and services of their choice. Further, the national regulatory authorities shall ensure that the degradation of service and the hindering or slowing down of traffic over networks are prevented by setting minimum quality of service requirements on telecommunication providers.

The implications of the changes are that every end user must be able to have access to the "open internet" and all content providers including the OTTs shall be able to provide their services via a high-quality "open internet". Further, all traffic on the "open internet" must be treated equally and the EU has communicated that there will be no such thing as paid prioritization (e.g. requiring end users to pay more to access a specific internet service, application or service provider such as Youtube or Spotify at a higher bandwidth).

The net neutrality regulation does not though prevent the offering of special services such as IPTV, high-definition videoconferencing or healthcare services. A precondition to offer the special services is that these are offered in addition to the "open internet", with a minimum quality of the "open internet" to be guaranteed.

Under the network neutrality regulation, reasonable traffic management will be allowed for as long as this is justified by technical criteria and it must be independent of the origin, destination and type of traffic. This can inter alia be measurements to preserve security and integrity of networks, e.g. due to denial of service attacks, viruses and malware. Temporary traffic management due to congestions is also allowed, but only if the congestion is temporary or exceptional.

Zero rating, i.e. where the internet providers do not count the internet traffic related to particular applications or services is also not prohibited, though it must be in line with the net neutrality regulation, e.g. the zero rating shall not have a negative impact on the "open internet" traffic.

BEREC has now been commissioned to develop the net neutrality specifications. With these specifications, the details of the net neutrality regulation will be laid out and until then, the rules on special services and the minimum quality of the "open internet" will still be somewhat unclear. The deadline for BEREC is the end of August 2016.

In total, the net neutrality regulation implies further regulation on telecommunication providers:

> The negotiation power of telecommunication providers when these are dealing with OTTs is (partly) diminished as the end users are guaranteed to access all applications and services of the OTTs by regulation.

> A limitation of the possibilities to prioritize traffic or discriminate over the "open internet" means that telecommunication providers first have to invest in

the "open internet" before any special services can be offered. This increases the required amount of investments and limits the market potential of services and applications with prioritized traffic.

Outcomes on telecommunication operators

The unleveled playing field will have different negative outcomes for telecommunications operators in different markets, ranging from no or little impact in the messaging and voice markets to significant impact on the internet access markets.

The markets for messaging, including SMS, is not included in the market recommendation of the EU and hence, the sector-specific regulation does not have a direct negative impact on these markets. In spite of this, the OTT messaging services like WhatsApp, Threema and Skype etc. have taken a large fraction of the messaging market at the expense of the telecommunications provider. Interesting to see is that in France, where SMS is regulated, the success of OTT messaging services has been limited. Hence, sector specific regulation in the messaging markets has had little negative effect on the telecommunications operators. The reasons for lost market shares in the messaging markets are more likely to be found elsewhere than in the field of regulation.

The voice services are subject to heavy regulation focusing on the wholesale markets (interconnection/termination services). The regulatory regime sets interconnection rates which are charged for all voice traffic to telephone numbers (e.164-numbering) terminating in other networks than the network of the calling party. The interconnection charges are not applicable for on-net calls (within the same network) or calls terminated over/between OTT platforms only. This implies that there are net payments for voice calls from OTT players to telecommunication network providers and the OTTs are working on own services to avoid using the e-164-numbering in order to also avoid these interconnection charges, e.g. Facetime-, Skype- or WhatsApp-calls. As a result, it is to be expected that the competition from the OTT services will more likely reduce the need for regulation.

The fixed access markets are heavily regulated by sector specific SMP regulation and net neutrality regulation. With regulated wholesale offers and prices, there is a cap on revenues generated by the telecommunications providers. This is problematic as the roll-out of new fixed access networks (NGA/FTTx networks) require significant up front investments requiring future revenue streams. The net neutrality regulation further limits the telecommunications provider when dealing with OTT players, as the telecommunication providers are obliged to transport all OTT services over their networks at a minimum quality. Hence, the regulatory framework favors the OTT over the telecommunication providers by creating an unleveled playing field. It increases the likelihood that the telecommunications providers are turned into so called bitpipe providers, only offering the basic internet access but no additional services.

The markets for special services such as IPTV are not included in the EU recommendation on markets susceptible to sector specific regulation and the telecommunication operators are allowed to offer these services the way they like, as long as it does not have a negative impact the "open internet". As the telecommunication providers are obliged to offer an "open internet" carrying the OTT services (including streaming services such as Amazon Prime or Netflix), the possibilities to provide differentiated special services is limited, but still remains a window of opportunities for the telecommunication providers.

The market for mobile broadband is subject to the same net neutrality regulation as the fixed broadband markets but there is no sector specific regulation of dominant operators. Another difference to the fixed internet is that the tariffs offered are in most cases semi-flat rates, i.e. the monthly fees include a limited traffic volume and additional volume is charged additionally. This implies that when the OTT providers offer traffic intensive applications and services, the end-users have to buy additional traffic volume and the mobile operators are generating additional revenues.

Relevant for mobile broadband services is also the zero rating, i.e. that the traffic volume is not counted for certain applications or services. The net neutrality regulation will most likely not prevent zero rating, which means that mobile operators can still in fact charge differently for different applications and services. Still, also for mobile broadband, the telecommunications operators are obliged to provide a high quality "open internet" according to the net neutrality rules, which means that there is still limitations to the mobile offerings and unleveled playing field, leading to less negotiation power for telecommunications operators when negotiating with OTT players.

■

About Network Neutrality and Competition

In 2013, it is fair to say that Telkom was disliked by all its stakeholders – government, the regulator, shareholders and customers. **Dr. Miriam Altman** was positioned to coordinate Telkom's strategic repositioning and turnaround. The early success of this programme is reflected in its share value rising from $1.2 in May 2013 to $6.6 in August 2015. Real improvements in company financials, regulatory matters, customer service and market repositioning are evident, as is Telkom's emergence as Government's lead broadband agency.

Telkom

Interview

Question: Although there is no globally and scientifically accepted definition of the term "Net(work) Neutrality" a common understanding exists that Net Neutrality is "a network design paradigm that requires broadband network providers to be completely detached from what information is sent over their networks. In essence, it argues that no bit of information should be prioritized over another" What is your opinion on Network Neutrality and to what extent does Net Neutrality impact Telco operator's business models?

Dr. M. Altman: I would like to approach this question from a different angle. Can you think of other industries where there is perfect competition? Or where a company is not able to shape the way its products are sold for its customers to segment, drive loyalty or volumes? Especially in industries that require significant investment? I can only think of economic activity dominated by small undifferentiated firms where there is limited innovation and investment, like call centres or small corner shops.

As an operator in a competitive environment we (Telkom) have to provide a product that is adapted optimally to the customer's needs. End users will profit from the ongoing price competition and improvement of our services, while efficient traffic management ensures that the user experience is at its best. Burdening the innovation and product management processes with a regulatory framework might in the end not only harm our business but particularly the experience of the end-user.

Question: Do you see impacts on the targets of Net Neutrality?

Dr. M. Altman: The stated goals of net neutrality would be better served by competition. Competition is a more important goal to achieve better service and access. Telecommunications is still a scale business, so competition is best effected with a sufficient number of companies – eg 3 or 4 – that can provide a real contest for each other. So, customers should be able to move between operators if they want a different product, and sufficient competition would bring forth new products and access points.

Question: The term "Net Neutrality" currently was and is subject to heated debate in both the United States and the Europe where regulatory frameworks have recently been introduced (i.e. the open Internet Act in the U.S.) or are in the process of being introduced (Telecoms Single Market (TMS) in Europe. In Africa, the topic has so far received little recognition. Are you expecting a regulatory debate on Net Neutrality in South Africa in the near future?

Dr. M. Altman: The government's ICT Sector Policy Review (published in March 2015) does discuss network neutrality and open internet principles, but mainly at a high level aiming to ultimately determine what would be the right framework for South Africa. Open internet mostly focuses on transparency in network management practices, no blocking of lawful websites, content, applications, services or non-harmful devices subject to reasonable network management and no unreasonable discrimination. So far, the topic has not received practical attention. There are far more pressing items on the agenda of the regulator ICASA (Independent Communication Authority of South Africa), such as the release of additional IMT spectrum for LTE to the market, a range of moves by operators to consolidate or the achievement and implementation of the government's national broadband strategy "SA Connect".

Question: Some of Telkom's competitors in the mobile space have recently launched partnerships with OTT players in the domains of messaging and music streaming. The underlying network principle here is the "zero rating" of a particular application or type of content. Do you believe that these OTT partnership models can have a disruptive effect in the market by increasing customer retention?

Dr. M. Altman: Partnerships between telco operators and OTT players are on the rise globally and in South Africa. They can be a competitive differentiator, but require careful thinking and design. The most common approach involves the operator zero rating the data cost incurred when using a major app such as Facebook or WhatsApp. I don't see this as a sustained differentiator, since we can all do it. The more significant differentiation will arise where partnerships are formed that add a material capability to the mix, such as customer analytics, financial transactions, media and the like.

Question: Should an operator build OTT type capability?

Dr. M. Altman: Few operators have the right DNA – they lack the agility, IT systems, innovation and software capabilities suited to app development. Generally it will make more sense to partner or buy. The experience of 'building' has been poor. Even the recent history of partnerships is strewn with mis-steps. This is not surprising as it is still early days. It helps us at Telkom, as we can learn much from this experience.

We are going to have to find avenues to increase population e-enablement in the use of broadband and online education content. We will need to craft strategies that enable low cost access to public education resources, while not undermining the viability of the network.

Question: From an operator's perspective, certain positions exist with regard to Net Neutrality that should be avoided at all cost as they have direct negative impacts on an operator's business model and the way commercial decisions are made (These include e.g. a general ban on network traffic management, the prohibition of data caps or the prohibition of exclusive partnerships between OTT players and telcos. At the same time, operators should lobby for a broad definition of Net Neutrality with regard to specialized services and for paid prioritization and zero rating as freely applicable commercial decisions. From your perspective, what are the regulatory positions that operators should aim to achieve and what are absolute No-gos for an operator?

Dr. M. Altman: Operators should be given the liberty to freely design competitive offerings (e.g. through the development of their own content distribution platforms or through dedicated partnerships with OTTs) without regulatory intervention. If consumers are not satisfied with a particular service they have the freedom to change to an alternative service provider. We are facing intense competition, and this drives us to reshape our prices to be more affordable and improve products.

One challenge of net neutrality is that it can create advantage for very large users who can clog up the network, at the expense of smaller users. An appropriate pricing framework is needed, so that it leads to the right rationing or usage that enables equitable high quality access. There is no service I can think of that is completely free. Even in areas like water and electricity, there is a small initial service that is free, and then a tiered approach that quickly ramps up to encourage rationing by large users.

The tolls on the national roads are also aimed at rationing. Operators should not be constrained to levy additional charges or throttle data usage, e.g. for excess data usage of big users (particularly video streaming or online gaming) during peak hours as this deteriorates the user experience for a larger number of customers that have more moderate usage. We need to be able to price to ration, and net neutrality could prevent us from doing so.

Question: The debate around Net Neutrality has significantly increased over the last years as there is an increasing awareness around the topic, particularly from the three dominant interest groups: the network operators, the OTT content providers and the end-users (retail customers). Do you think a telecommunications market has to reach a certain maturity level (e.g in terms of subscriber penetration), to justify net neutrality regulation or should net neutrality regulation be applied right from the start?

Dr. M. Altman: I frankly don't see how the implementation of Net Neutrality creates an advantage for the consumer. As it is right now the discussion in the public sphere is driven by a few stakeholders and in particular by heavy traffic users, that in my eyes profit the most from a Net Neutrality framework. A small group of individuals is optimizing their online experience, but this is not to the greater good of the end consumer or society. Instead, the access objectives can be achieved with the right competitive environment.

Dr. Miriam Altman is Head of Strategy and Regulatory Affairs for the Telkom Group, appointed to its Exco in June 2013. Telkom is South Africa's fixed line telecommunications operator. She is a Commissioner on the National Planning Commission in the Office of the Presidency, serving in its first term, from 2010 to 2015, and recently reappointed for a second term. This body was established to guide long term planning for South Africa.

Altman has a PhD in Economics from the University of Manchester, MPhil Economics University of Cambridge and BA Economics McGill University.

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Future Cost Based Broadband Access Regulation

Dr. Markus Steingröver

> Broadband Access Regulation of the future takes place in regional markets. Cost models must take this into account.

> What is needed are comprehensive regulatory cost models that are able to simultaneously cover multiple access technologies and services.

> Careful construction of cost models is necessary to avoid inconsistency in definitions in the relevant EU recommendations.

> Pure LRIC and LRIC plus can be calculated in a single model, if an iterative approach is used.

Telecommunications wholesale services of dominant operators are subject to cost-based regulation for a long time. Especially fixed access products and mobile termination are regulated according to the Long Run Incremental Costs of service provision as access and mobile termination are assumed to be bottlenecks in which market dominance can easily be used to restrict competition.

Future broadband networks of fixed operators will increasingly cover only selective regions as to avoid duplication of infrastructure. As a consequence wholesale access products will become increasingly important as retail service offerings outside the own coverage area will rely on this. Therefore a regional market definition will be the standard regulatory approach to investigate competition failures. Some current examples for a regional bitstream access regulation are the UK, Germany and Austria. This will lead as a consequence to the application of tariff regulation for broadband services to all operators not just one former incumbent as today. As an implication regulatory cost models will be needed covering a multiple of fixed and mobile broadband access services covering a variety of access technologies such as Fttx.

Challenges in regulatory bottom-up LRIC cost models

With the rollout of fibre access and LTE and the transition to next generation networks in recent years several challenges regarding regulatory cost modelling evolved. Moreover, the European commission issued recommendations related to regulatory cost modelling in 2009 and 2013 that changed and amended the existing best practice methodologies.*

The key challenges arising from the recommendations set out in EC 2009 are related to:

> the Implementation of a "pure LRIC" calculation logic in addition and parallel to the standard "LRIC+" approach,
> the definition of increment,
> different treatment of fixed and mobile networks in particular for two aspects:
  - consideration of access costs into termination rates
  - spectrum (mostly absent in fixed networks).

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* *COMMISSION RECOMMENDATION of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC) and COMMISSION RECOMMENDATION of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU).*

The key challenges arising from the recommendations set out in EC 2013 are related to:

> the mandatory parallel application of two different valuation methodologies – Modern Equivalent Asset (MEA) and Regulatory Asset Base (RAB) Indexation for fixed networks,

> the implementation of a single NGA network calculating both copper and fibre services.

Pure LRIC approach

To harmonize prices in Europe the European Commission (EC) recommends to follow a uniform pure LRIC cost standard based on an analytical bottom-up model. Hence, a theoretical efficient network is modelled and on that basis costs are calculated for each service. The transition from LRIC+ to Pure LRIC bottom-up models is advised only with regards to voice call termination services, whilst LRIC+ bottom-up models shall remain to model access related services, which involve normally fixed access networks and so called last-mile wholesale services.

The pure LRIC approach is based on the idea of avoidable costs; only costs that could be avoided if the service wouldn´t be offered are part of the costs taken into account. Common and joint costs are not considered. Hence the more services are covered by the pure LRIC approach the larger is the funding gap – parts of the costs incurred are either not covered or shifted to other services not subject to the pure LRIC approach. Especially for network industries, that have regularly a high share of fixed costs, this effect is considerably high. Therefore and following the waterbed effect – lower prices for one service lead to higher prices for another – the retail prices for customers will rise.

Definition of the increment

A further point that needs to be clarified is the definition of the increment. This can be done ambiguously ranging from all services being the increment to one single service being the increment. The decision is left to the discretion of the NRAs - leaving a ample room for debates within the industry. The EC recommendation does not give clear guidance on how to define the increment. It simply states that relevant costs shall be based on the subtraction of total costs and costs without the particular increment. Incremental costs only cover traffic volume related costs of the particular increment. Obviously there are massive consequences of different increment definitions and the resulting pure LRIC service. Also depending on the definition of the increment unit costs – for example per minute – of a particular network element would be different for different services.

To illustrate a possible impact let us presume that the increment is per single service. In that case mobile call termination (MCT) and mobile call origination (MCO) are treated as two different increments (in addition to many others like on-net voice and video calls, SMS, data, etc.). To provide the services an operator will need network infrastructure (radio, transmission, core, OSS, BSS, etc.) Part of the BSS will be the wholesale billing platform that will enable the settlements between the operators for the services MCT and MCO.

This platform has little if at all something to do with incremental volumes, as it is used for analysis and reporting of the overall volumes between operators. Applying the subtraction analysis (total costs – costs_without_MCT will effectively exclude the wholesale billing costs from the service leading to the paradox that a wholesale service will not include a cost component that is only needed for providing wholesale services. Enforcing such a pure LRIC cost approach leaves operators being forced to recover these costs via other non-voice wholesale or retail services.

In addition, practical modelling effort will increase in relation to the size of the increment. Calculating every increment's cost without that particular increment's traffic volume will demand extra data storage that can lead to significant model complexity based on the need to rerun the model several times to calculate the delta for the pure LRIC approach. Those results need to be compared to the standard results and all the differences have to be stored to calculate the unit cost for the pure LRIC exercise.

Single model – two standards

It is a fact that cost models for telecommunication network services cannot be developed in isolation. Cost models by definition consider the whole relevant cost structure of the modelled operator, in order to estimate at the most possible extent, the incurred costs to provide a particular service.

The simultaneous treatment of both LRIC approaches, when developing integrated models, face several implementation challenges that are amplified with the incorporation of additional recommendations on regards of asset valuation concepts and the handling of the changeover of legacy network technologies to modern ones.

Regulatory Asset Base concept (RAB)

The incorporation of other regulated utility sectors experiences, like the Regulatory Asset Base (RAB) concept, which is based on actual investment and depreciation of non replicable and reusable civil engineering assets, adds to the generally accepted methodologies an additional method, which defies the development of a consistent single cost model, in which different approaches are mandated to coexist.

Unification of methodologies

The guiding principles provided by the recommendations as a whole, give enough space for interpretation as well as a high grade of flexibility in the parameterization of fixed and mobile networks cost models, which makes the harmonization of such costing exercises across different countries, challenging and even more complicated than in the past known experiences. Additionally, the indication to implement a single NGA network calculating both copper and fibre technology services hinders the identification of modelling assumptions to reflect a proper technical realization.

Different treatment of access costs

The different treatment of the access costs in fixed and mobile networks is another challenge. In fixed termination rates access costs are not included while for mobile there is no core-access separation, i.e. all relevant costs are attributed to the wholesale service. From modelling perspective this may create inconsistency issues in the case of fixed-wireless networks. Allocating access costs in a fixed-wireless network might become arbitrary. As mobile access is usually not regulated this issue requires attention from regulators.

Spectrum costs in pure LRIC models

Spectrum is a particular issue for mobile LRIC costs. As outlined above the pure LRIC calculation will remove all non-traffic related costs. Therefore spectrum costs will typically be excluded from the LRIC costs. To include or not include spectrum costs was always the debate. These costs were excluded or allocated as equi-proportionate mark up in LRIC+ models as part of the „plus". Spectrum is however used dynamically for all mobile services and in a scenario where on-net calls are less than off-net it will appear that the services that use more often the spectrum will not be charged for it.

Regulatory Asset Base indexation method

The recommendation specifies that certain network assets (civil engineering) have to be valued with indexation approach (for the civil engineering RAB) while the rest with modern equivalent asset (MEA) approach. This creates significant challenge since the model has to be developed to support two methods at the same time. Furthermore in order to apply this indexation method to RAB a very detailed information has to be available – accounting data showing the exact value less amortization of the RAB, the percentage of the RAB that can be reused for new deployment (NGA) and an appropriate index. The commission recommends as a possibility the application of a retail price index. So the first challenge is that NRAs have to specify and request from operators predefined type of data to be collected and reported. Obviously if data was not historically stored and reported with higher levels of granularity it will deem the application of RAB extremely difficult, at least in the short term.

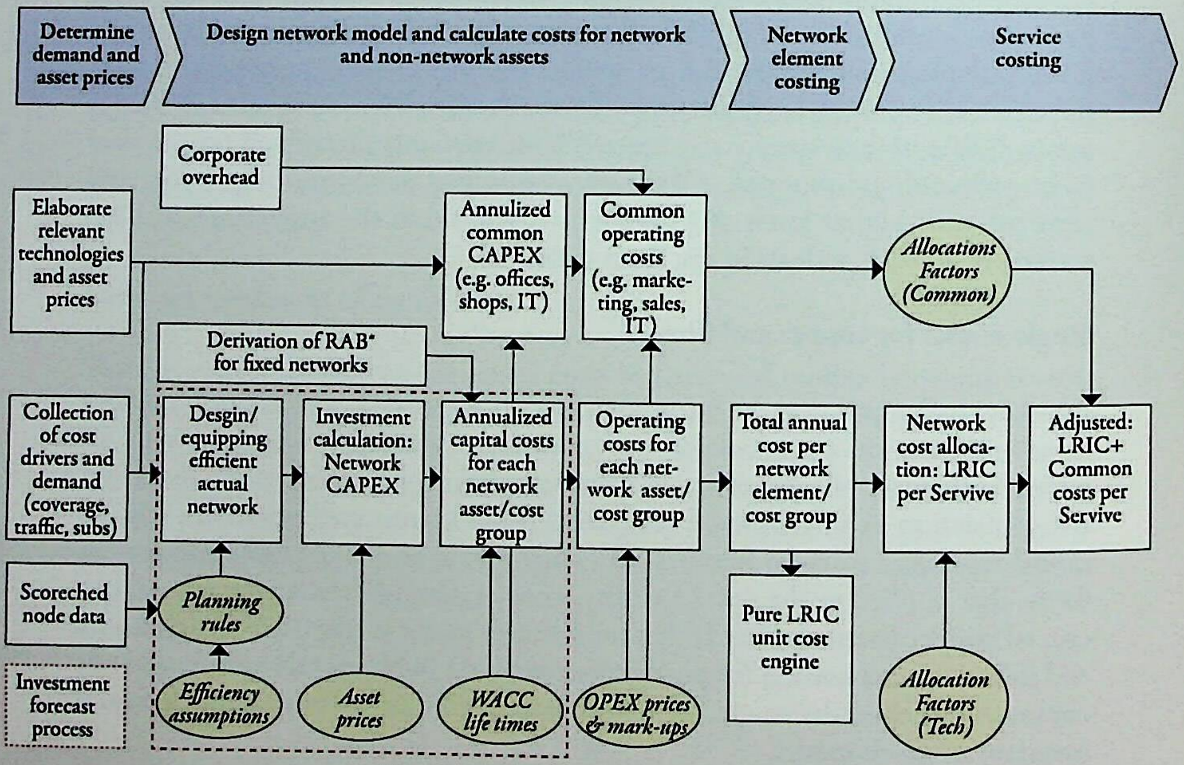
Single model for copper and fibre

Another challenge is that the recommendation suggest that both copper and fibre broadband services be calculated with a single model, with single demand. In reality both types of services could have very different network realizations and the application of single model suggestion poses unanswered questions – if the model calculates costs for fibre services what would be the plausible adjustment factor that applied to the cost of a fibre based service will determine the correct cost of copper based service. If that adjustment factor is related to the elements and infrastructure needed for pure copper network (without taking into account common trenches, ducts, etc.) it would probably be better to consider a mixed (overlay) network model.

While currently CATV operators are not subject to cost based wholesale regulation in the future cost models will also have be applied regionally. Integrating CATV networks into a single model would not change the principal approach but further increase complexity.

As it can be seen the EC recommendations pose challenges mainly due to the level of detail that is provided and the under estimation of the required effort to implement practical costing tools. To overcome those challenges it is advisable that in addition to pure LRIC also LRIC+ is simultaneously implemented so that more relevant costs are attributed selectively to the cost of services. Also it is a good practice to develop models which have extended logic than the one recommended so that necessary adjustments can be done and unreasonable results avoided. To finalize having two or more estimates for a cost of particular increment provides higher awareness of the cost drivers and enriches NRAs with deeper understanding of the relation between demand and supply in telecom services.

Figure 1: Updated Bottom-Up LRIC Modelling Approach


Determine demand and asset prices
Design network model and calculate costs for network and non-network assets
Network element costing
Service costing
Corporate overhead
Elaborate relevant technologies and asset prices
Annulized common CAPEX (e.g. offices, shops, IT)
Common operating costs (e.g. marketing, sales, IT)
Allocations Factors (Common)
Derivation of RAB* for fixed networks
Collection of cost drivers and demand (coverage, traffic, subs)
Desgin/equipping efficient actual network
Investment calculation: Network CAPEX
Annualized capital costs for each network asset/cost group
Operating costs for each network asset/cost group
Total annual cost per network element/cost group
Network cost allocation: LRIC per Servive
Adjusted: LRIC+ Common costs per Servive
Scoreched node data
Planning rules
Pure LRIC unit cost engine
Investment forecast process
Efficiency assumptions
Asset prices
WACC life times
OPEX prices & mark-ups
Allocation Factors (Tech)

* *The Regulatory Asset Base (RAB) is applied to non replicade and reusable civil engineering assets and is determined after analysis of a detailed Fixed Asset Register (FAR)*

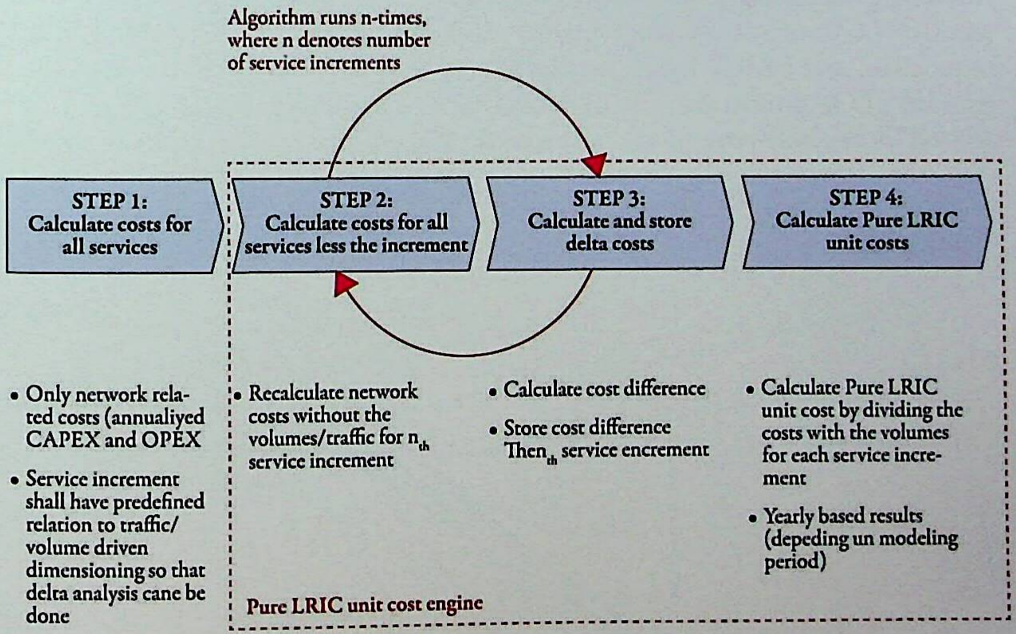
Source: Detecon

An updated modelling approach

In order to meet all the challenges above and being able to effectively model service costs of Next Generation Access, include LTE services and to effectively comply with the EC costing recommendations thereby enabling the best possible foundation for NRAs decisions, a restructured regulatory cost modelling approach is needed as depicted in the figure 1.

The starting point – as usual in bottom-up modelling – is to forecast the service demand. This is the principal input to dimension the network and calculate the corresponding costs and helps to derive as well non-technical costs. These costs, based normally on current and forward looking cost accounting, are transformed in annualized CAPEX (including if applicable the exceptional treatment for non replicable and reusable civil engineering assets based on RAB) and OPEX for technical and non-technical costs categories. This information is finally used to

Figure 2: Pure LRIC Methodology


Algorithm runs n-times, where n denotes number of service increments
STEP 1: Calculate costs for all services
STEP 2: Calculate costs for all services less the increment
STEP 3: Calculate and store delta costs
STEP 4: Calculate Pure LRIC unit costs
• Only network related costs (annualiyed CAPEX and OPEX
• Service increment shall have predefined relation to traffic/ volume driven dimensioning so that delta analysis cane be done
• Recalculate network costs without the volumes/traffic for n_th service increment
• Calculate cost difference
• Store cost difference Then_th service encrement
• Calculate Pure LRIC unit cost by dividing the costs with the volumes for each service increment
• Yearly based results (depeding un modeling period)
Pure LRIC unit cost engine

Source: Detecon

calculate unit cost per each relevant service. This is done by distributing tech-nical and non-technical costs by applying allocation rules that are principally based on network utilization. The approach preserves that common operating costs are distributed via allocation factors to the defined services. This allocation exercise generates LRIC+ unit costs per service.

To calculate unit costs based on the pure LRIC methodology a delta approach is used. The network is modelled once for all defined services and once for all services without the provision of the determined service increment. In a next step, the difference or delta between both total costs is calculated to be afterwards divided by their corresponding incremental volumes and/or traffic in several simultaneous models running sessions as described in the figure 2.

Solving new challenges with regulatory cost methodology

The transition to NGA and NGN as well as the introduction of LTE requires a new cost modelling approach. Moreover the need to comply with recent EU recommendations poses several challenges to regulator cost modelling. These challenges have to be carefully analyzed and specific solutions that are matching the particular regulatory needs have to be implemented. A comprehensive methodology should be implemented in a flexible and transparent manner. This regulatory costing methodology enables regulators or operators to calculate both pure LRIC and LRIC+ for all pre-defined services in full compliance with the relevant EU recommendations. Moreover, new technologies such as LTE, FTTx and NGN are fully covered and all corresponding regulated services are covered.

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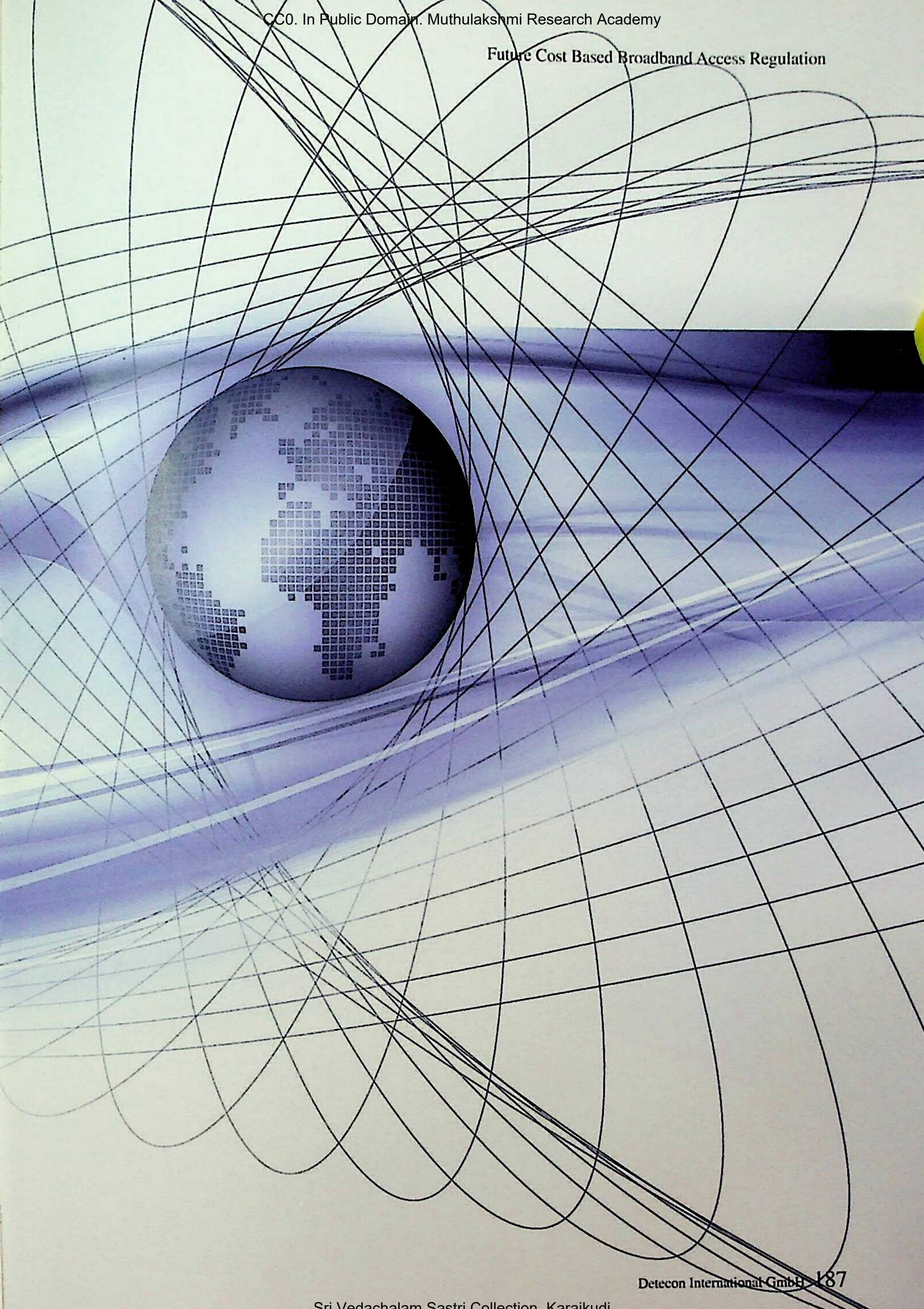


Open Access with a Mobile Wholesale NetCo

A new idea to solve broadband coverage: The case of Mexico

Ulrike Eberhard, Dr. Arnulf Heuermann

> In 2013 the Mexican government and the main political parties agreed on constitutional reform in the telecommunications sector. Objectives were the access to better and cheaper telecommunications services and increase the competitiveness of the Mexican economy.

> Cornerstone of the reform is the project Red Compartida which pursues the vision of „broadband for all".

> The concept is to create by a wholesale operator a common network for services that are not bundled and non-discriminatory.

> If Red Compartida runs profitable, the idea of national wholesale operators may spread in many countries. There are advantages and disadvantages of this concept.

Mexico is the second largest country in Latin America with a population of about 120 million people, of which 22% are living in rural areas. Mexico is a "middle income" country according to the World Bank classification, with a nominal GDP per capita of more than 10.000 USD, an unemployment rate of just 5% and stable economic growth.

Background – market environment in Mexico

The structure of the mobile market shows three major players: AT&T, Telefónica and Telcel. Telcel dominates the MNO markets with more than 70% market share and belongs to America Móvil, which also owns the incumbent fixed line operator Telmex. Since 2007 fourteen MVNOs have entered into the market, however their market shares are below negligible and do not reach 1% in total.

In the fixed market there are six major players besides Telmex, who are offering fixed voice, broadband, B2B, cable TV and WiFi Hotspots. Four of them have a major mobile portfolio gap, while the other two have relatively unsuccessfully entered the MVNO business.

Competitive conduct between the MNOs is hostile, with little infrastructure sharing and co-operation. Regulatory decisions have been blocked through endless court cases.

A major concern for the Mexican government is ICT market performance, showing a comparatively poor development. Availability of services is limited. Fixed telephone penetration is about 60%, broadband household penetration 33%. The mobile SIM penetration is currently about 90%, very low when compared to similar countries like Argentina, Brazil or Chile where penetration rates between 135% and 155% have been reached. Quality of service in mobile networks is low while prices are well above most OECD countries. There is a poor performance in internet usage. While the Mexican economy is ranked second in Latin America, the country is ranked 20th in terms of internet users.

Mexican Government's objectives and regulatory initiatives

In 2013, the Mexican Government and main political parties agreed to a constitutional reform changing the legal framework of the telecom sector.

The major objectives of the reform were to give Mexicans access to better and cheaper telecommunications services and to raise the competitiveness of the Mexican economy.

The reform introduced an individual right for the Mexican citizen to have "access to timely information from multiple sources and to seek, receive and impart information and all types of ideas by any means of expression." This right includes that "the State shall guarantee the right of access to communication and information technologies, as well as broadcasting and telecommunication services, including broadband and internet access."

The institutional framework was changed. The old regulatory body has been dissolved, and a new "Federal Telecommunications Institute (IFT)" has been created to improve the predictability and enforceability of regulatory decisions. In addition an antitrust commission (COFECO) and specialized courts for ICT cases have been founded. The status of IFT as an independent and autonomous body has been fixed in the constitution (Art. 27 & 28). Any IFT decision can only be appealed through juridical review, the decision taken by the authority is not suspended for the duration of the court case.

The regulatory environment foresees a strict ex-ante regulation of dominant players and an ex-post regulation of all other players. Telcel has been declared "preponderant" and is obliged to offer interconnection free of charge until its market share falls below 50% in the future. In addition it has to offer numerous wholesale services to its competitors on conditions to be fixed in reference offers, including access to passive infrastructure.

To ensure universal access two projects are under way - a shared mobile network (Red Compartida) and a fixed network program (México Conectado) improving connectivity in schools, hospitals and other public areas on a municipal, provincial and federal level.

The cornerstone of the reform will be the project Red Compartida (RC). RC is the constitutional mandate to create a shared network through a wholesale-only operator providing services that are unbundled and non-discriminatory. The Minister of Transport and Communications clearly stated: "Doing business as usual, mobile services will not reach unprofitable markets. RC's model will allow coverage in otherwise unserved or underserved areas."

> The vision of the project is to provide broadband access for all.

> The mission is to deploy a shared wholesale network that enables the provision of telecom services through existing and new service providers.

> The goals are to increase coverage of mobile broadband services, to promote competitive prices, and to raise quality to international standards.

The concept of a mobile wholesale LTE network

Red Compartida (RC) will be implemented as a Private Public Partnership (PPP), where the State is represented by Telecomm and the newly created entity OPRITEL. The private developer will be selected through a request for proposals. Nonetheless, RC is envisioned in its essence as a private venture, where the Mexican Government will neither be part of the shareholder base nor will it be involved in network design, deployment or its commercialization.

OPRITEL is a special organization within the Ministry of Communications which will receive the spectrum license from the regulator (IFT) and which will pay the spectrum fees. OPRITEL together with Telecomm will close a PPP contract with the developer, lease the spectrum to the developer, take receipt of the leasing fees, and control the wholesale and coverage obligations of the developer. The developer will eventually consist of the operator and its equity partners and possibly other retail operators. RC will have a license for 20 years.

> The major input from the State is the allocation of a premium, unencumbered contiguous spectrum of 2*45 MHz in the 700 MHz band (703-749MHz X 758-803MHz).

> In addition RC will get the right to use a fiber pair from the Federal Electricity Commission's fiber network mounted to the power grid as a backbone service. The total fiber network length is about 30.000 km.

RC will not be allowed to sell directly on the retail market. Its customers are therefore the existing MNOs (who may need additional coverage and capacity), fixed line operators who need to close "4-play" portfolio gaps using MVNO services, and other private and public MVNOs.

As compensation for the roll-out requirements and the prevented direct access to the retail markets the Government has decided to sell the spectrum at 0,002 USD/MHz/inhabitant, which is well below international benchmarks. The Government expects a minimum total roll-out obligation of 85% population coverage after five years, with annual milestones before that. The first milestone is the population coverage of 30% which has to be deployed by the end of the first quarter in 2018. In fact the final population coverage will most likely be much higher than the obligation, as this target is the winning criterion for the applicants.

Measuring population coverage is not trivial. Apart from problems of outdated census data and differences between digital maps a clear definition of what coverage means is needed.

The graphics above show the population distribution at the level of administrative borders. The Government has defined a minimum cell-edge-data rate of 4Mbps download and 1Mbps upload measured at peak hour as the criterion for acceptable coverage. These data rates do not seem very high for high-density areas, but compared to a cell-edge speed of 512Kbps the number of sites has to be increased by 30% just to meet the coverage criterion.

As minimum required coverage the following milestones for the roll-out phase have been defined by the Government:

> 30% of the Aggregate Population as of March 31, 2018,
> 50% of the Aggregate Population as end of year 2019,
> 70% of the Aggregate Population as end of year 2020,
> 85% of the Aggregate Population as end of year 2021,
> 0,5* (85%+Offered %) of the Aggregate Population as end of year 2022,
> Offered % of the Aggregate Population as end of year 2023.

The Red Compartida business plan is mainly based on selling national roaming services to MNOs and wholesale services to MVNOs. It is the mandate of Red Compartida "to share its entire infrastructure and the unbundled sale of services and capacities, exclusively to marketing firms and telecommunications network operators under conditions of non-discrimination and competitive prices."

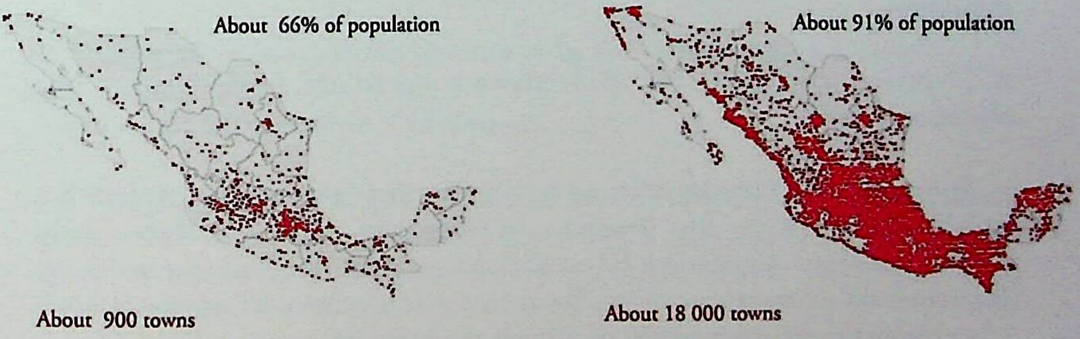
Major services will be:

> National Roaming services for MNOs (providing capacity and filling rural and indoor coverage gaps).

> Hosting MVNOs on the Red Compartida network. These can be differentiated into two groups: "Full MVNOs" like fixed operators with a portfolio gap in mobile will build a complete network infrastructure except radio access and mainly buy access services. "Light MVNOs" like retail chains that sell SIM cards with their own logo will buy a number of additional network services from RC, including internet gateway access, transport, billing etc.

> Sharing of transport network and Radio Access Network with other operators may also be a part of RCs portfolio, but certainly with a minor revenue potential.

Figure: Distribution of the Population at the Level of Administrative Boundaries



Population Centers with >10 000 Inhabitants

Population Centers with >500 Inhabitants

Source: Detecon

Prior to the final RFP, which was published end of January 2016, the Government was considering allowing sub-leasing of RC's spectrum to other MNOs. However, this idea was much debated, as it was principally against the idea of Red Compartida. Sub-leasing would lead to a slicing of the spectrum between many operators and a parallel roll-out of infrastructure – which contradicts the idea of having one efficient network with lower costs and higher data rates. It is also unlikely that spectrum could be sub-leased at prices which would compensate the Developer for services with a higher value-add like national roaming, thus putting the viability of the project into doubt.

Economic and technical advantages and disadvantages of the concept

The pure commercial roll-out of broadband networks in Mexico started in the major cities and then slowly penetrated smaller cities and rural areas. This typical development also left some unprofitable regions as "white spots" or underserved areas.

The rationale behind this was two-fold. The wealthiest customers, as well as those who are most innovation-oriented, live in the largest cities and can afford high-speed ICT services. The CAPEX per user in telecommunications networks is highly dependent on the customer density - which means metropolitan centers like Mexico City have low costs per user while sparsely populated areas can only be connected at exponentially rising costs.

With the rising importance of ICT services and the underlying telecommunications infrastructure, governments around the world cannot easily accept the existence of large white spots in their countries. There are both supply side and demand side arguments that underline their attempts to reduce white spots to a minimum.

ICT service production and ICT network operations have different cost characteristics:

> The millions of apps in different App-Stores show that service creation is a typical market with few market entry barriers and low fixed costs, where customer segmentation, specialization and innovation are king. Thousands of competitors may offer such services at very affordable prices – a free competitive market structure delivers the best performance.

> ICT network operations, and in particular building access networks with nation-wide coverage, have very high fixed costs. Once a street has been opened for a fiber cable, or a region is covered by a mobile site, adding an additional subscriber invokes very low marginal costs. If such infrastructure is duplicated by a second or third network operator the revenue from a pro-portionally reduced market share will typically not cover the costs, in particular in low density areas. Theoretically a monopoly could actually serve the market at lowest cost per user, the inefficiencies of monopolistic conduct are however well-known and may over-compensate for technical efficiency gains.

From the demand side the political participation of all citizens of a state in access to information, as well as the capability to participate in interactive ICT services for eGovernment, eHealth, and eLearning services is often regarded as a basic right that should be offered to everyone at affordable prices. In addition, a high penetration and usage of ICT services has positive "external effects" on the economy as a whole, as can be measured by incremental growth of GDP for example. This GDP growth may not benefit the network operators directly, but may result in higher tax income for the government. Even from a purely economic point of view it is rational for a state to somehow support the ICT sector over and above the purely commercial level which would result from free market forces.

Governments have typically chosen the following options to foster the development of their national ICT sectors:

> Profit gap financing,
> Mandatory infrastructure sharing, and
> National public broadband network expansion.

A national wholesale network operator is the fourth and new alternative.

The concept has a number of advantages:

a) A single operator who gets an unsliced portion of the whole 700MHz spectrum should have the lowest cost for covering the country. The cell size in this band is substantially larger than in bands with higher frequencies and therefore for customers on the move (along roads etc.) and in low density rural areas fewer cells have to be constructed to provide coverage. This saves substantial CAPEX.

b) With a larger amount of bandwidth compared to sliced smaller spectrum lots a single wholesale operator can offer higher data rates per cell than several operators could. Broadband targets can be achieved much easier.

c) The 700MHz spectrum penetrates walls much better than spectrum in higher frequency bands, therefore in-house coverage is less costly to achieve.

While these advantages of a "natural monopoly" on the physical network side can be achieved, service competition in the retail markets will be intensified. The smaller MNOs will get relatively cheap and fast access to currently non-covered areas at much lower cost than they have to pay to the incumbent. RC is a specialized network to host all types of MVNOs. This will lead most likely to a boost of the MVNO market in Mexico with increased price and quality competition for specific customer segments.

The current status of the project "Red Compartida"

The project has been being planned for a long time in Mexico, and even following political agreement the concrete implementation steps have taken several years to be achieved. The complexity of implementing a totally new concept should not be underestimated by the many observing countries, which also intend to implement similar solutions.

Major process steps to prepare a Request for Proposals (RfP):

> In 2013 the constitutional change came into effect which defined the project "Red Compartida".

> In July 2014 year the Federal Telecommunications and Broadcasting Law was changed to accommodate Wholesale Open Access, with much discussion about the pure wholesale mandate of the Open Access Provider and a possible participation of the existing retail operators.

> In summer 2014 the Ministry (SCT) and the independent regulator (IFT) signed a contract to jointly implement the project Red Compartida. In December 2014 a USD 7m contract to design the process was signed by the SCT with an advisor.

> In January 2015 a contract to design the regulatory framework was signed by the IFT with an advisor.

> An Expression of Interest followed in March 2015, which was answered by several interested parties.

> In July 2015 a first public consultation round for an RFI1 was published and commented, followed by a modified RFI2 in September 2015. The RFI included the drafting of all relevant legal documents, in particular an Invitation to the International Tender, Preliminary bidding rules, Templates of the PPP agreement, Rules of IFT to prevent consortia with anti-competitive influence, Spectrum concession title, Template for the concession title for wholesale service provisioning.

During the consultations the conditions for roll-out obligations, selection criteria, minimum technical quality criteria etc. have been modified several times.

The final RfP was published end of January 2016. Public consultations were held from February 26th until March 18th. The bidders are requested to apply for the Anti-Trust opinion at the IFT latest by August 08th. The final bids are due by September 08th. The selection of the winning bidder is set for end of September. The PPP contract will be signed early December. Even though the SCT promoted the project at different events and during dedicated road shows in the US, Europe and Asia there is still a limited number of consortia interested.

Regulatory considerations

The creation of a mobile wholesale-only Open Access Provider is a new phenomenon. It is not easy to find international examples of a successful regulation. However, if the European Commission's framework for market analysis would be applied the following considerations should be taken into account.

Although RC will have a monopoly in one spectrum area, all other MNOs are able to compete in the LTE wholesale markets using other spectrum. In the Mexican market for mobile service termination the existing MNOs even have a position of economic strength and joint SMP, because amongst others:

> They are vertically integrated and thus control access to retail markets.
> They control the existing 2G, 3G and LTE access networks and thus an essential facility for RC.
> Market shares, overall size and access to capital markets is extremely asymmetric.
> There is low countervailing demand side market power for RC.

It therefore might be expected that oligopolistic tacit collusion could occur amongst the MNOs with them leveraging their vertical market power through

- refusal to deal, in particular in national roaming and thus trying to economically "dry out" RC,
- exclusivity contracts, in particular for international roaming partners or existing MVNOs, bundling and tying in particular retail and wholesale services,
- delaying tactics in negotiations with RC about infrastructure sharing, inter connection etc.,
- price or quality discrimination,
- cross-subsidization etc.

The national regulator therefore has a massive task to get RC running as a start-up company. A particular concern may be exclusivity contracts. MNOs with SMP should therefore not be allowed to set exclusivity clauses in commercial contracts for International and National roaming services as well as Host MNO services for MVNOs.

Due to a lack of Significant Market Power (SMP), Red Compartida should be free in the start-up phase to set commercial wholesale prices. Ex-ante regulation might be limited to transparency and non-discrimination.

MNOs should be obliged to offer non-discriminatory open access products including national roaming to RC, and this has to be enforced in a reasonable time-frame.

It will also be very important to limit the influence of the existing retail MNOs on RC's operations, or at least to balance this influence to avoid one of them abusing the new market constellation.

Summary & outlook

There are few examples of functioning wholesale-only operators. The carrier "Yota" in Russia could be compared. Yota operated a wholesale LTE network with 30 MHz in the 2.5 and 2.7 GHz band, covering 180 cities with about 70m people. However, in 2013 Megafone acquired 100% of the shares of Yota and integrated operations into its existing mobile operations Interestingly Megafone decided to use the Yota brand for its own MVNO. In Rwanda a mobile wholesale only network was launched under a PPP scheme together with Korea Telecom in 2014. The Kenyan government started with a similar approach but with more management involvement by the public sector slowing down the process. The Kenyan mobile operator Safaricom already announced not to wait any longer for the public network but to roll out its own LTE network eventually.

Another example is the Czech Republic. In June 2015 PPF, the new majority owner of O2 in the Czech Republic split the company into a NetCo called Cetin and a ServCo still called O2. The minority shareholders were offered shares for O2 worth 31% of the combined share price and 69% for Cetin. Cetin offers fixed and mobile wholesale products to all operators in the country. It is interesting to note that the share price of Cetin stayed constant until end of 2015, while the virtual mobile operator value more than tripled over that same period. The RfP for the project Red Compartida has been published on 29th January 2016. It will be interesting to observe how many consortia participate in the bid and which level of population coverage can finally be achieved.

At the time of writing there were three groups rumored to be setting up their consortia, securing the necessary funding and preparing their bids for Red Compartida. None of them is supported by an international telecom operator. Two of the groups are specialized in funding infrastructure projects. They most probably pursue a state of the art wholesale network approach. The third group, lead by Rivada Networks, promotes its bid with an innovative business model centered on their dynamic spectrum and capacity arbitrage technology.

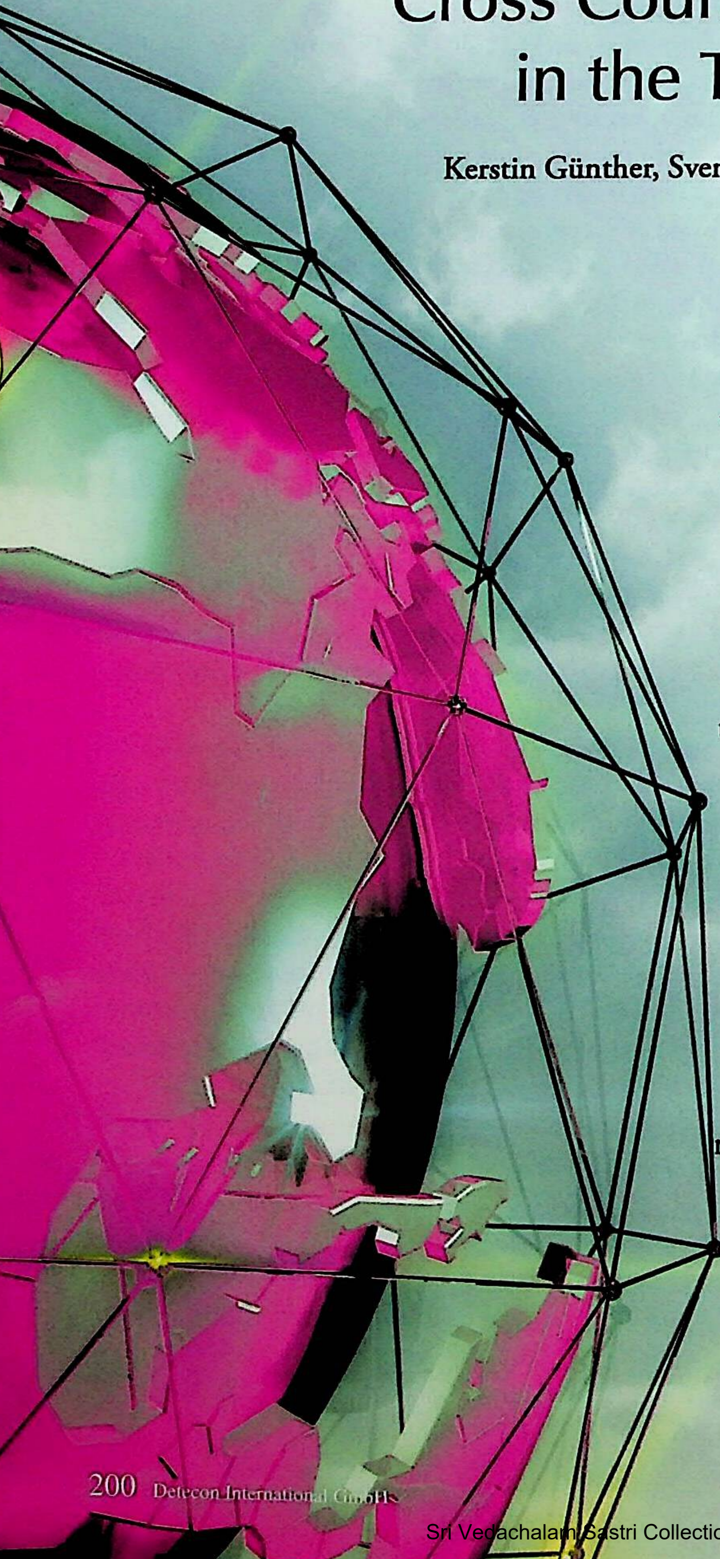
It enables the dynamic selling of excess network spectrum or capacity to commercial tenants, i.e. an approach similar to the today known exchanges for energy. Rivada Networks is also participating in the ongoing bid for FirstNet, a nationwide public safety LTE network in the 700 MHz band of the US Government.

Several other countries are observing Mexico with the potential intention of copying the approach. In particular South Africa is also planning to have a "national wholesale operator" in mobile. If Red Compartida becomes commercially viable the whole idea of national wholesale operators as a new instrument to boost national broadband roll-out may spread to many other countries.

■

A New Perspective on Cross Country Synergies in the Telco Industry

Kerstin Günther, Sven Hischke, Alexander Meissner



> Currently Telecommunications companies are not able to take advantage of their size. While OTTs realize economies of scale from their international production, the "group effects" are limited to indirect areas.

> In order to remain competitive in the future, telcos need to bring their production from a multi-national to an international level.

> Virtualization as a key technology provides the basis, however a radical simplification of the services is required.

> The Transformation from multi-national to international means changes, that go far beyond pure system and process adjustments.

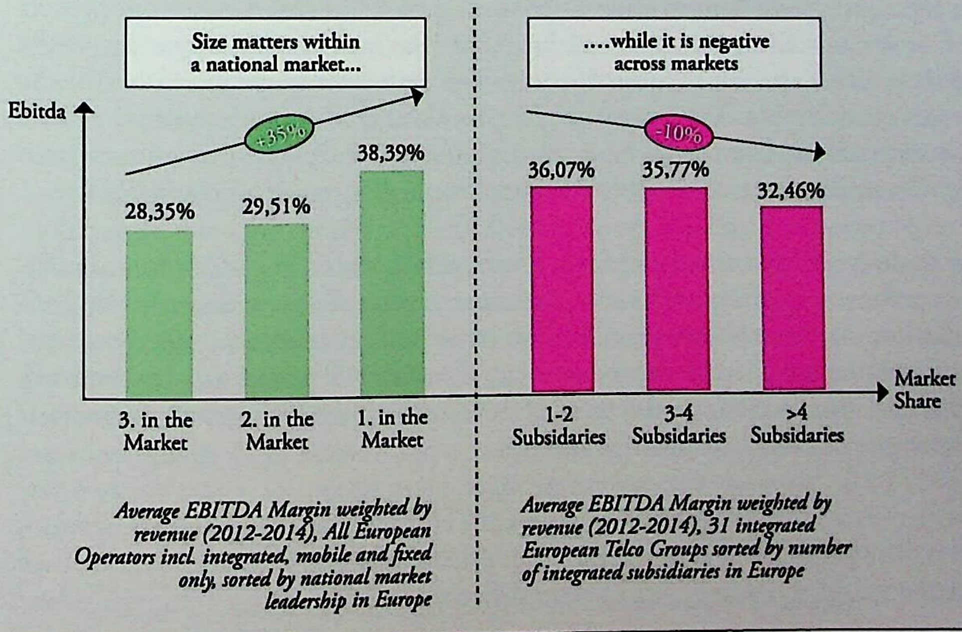
What is the biggest difference between an Over The Top Player (OTT) and a telecom operator? Why have many global OTTs like WhatsApp or Netflix been so successful in the last decade and telecoms not?

Regular answers are the innovation power, the mindset and genius of the entrepreneur or young and highly motivated staff. But there is one answer that is not so much recognized in the public domain but plays a crucial role: OTTs work and produce international and use big scales and size to their advantage while telecoms don´t.

Today the telecommunication carrier business is rather multinational than global

If a global OTT like Netflix enters the European market it uses one logical production platform, one product design, one CRM system to serve multiple countries. Local customization is limited to language and partly content. Telecoms usually have national production platforms, own IT, own product development, local product managers and you name it in every country they are invested in. If a Telecom wants to bring a new offering to a broader scope of countries it means full scale implementation projects for each of them.

Figure 1: EBITDA Development Within and Across Markets



Average EBITDA Margin weighted by revenue (2012-2014), All European Operators incl. integrated, mobile and fixed only, sorted by national market leadership in Europe

Average EBITDA Margin weighted by revenue (2012-2014), 31 integrated European Telco Groups sorted by number of integrated subsidiaries in Europe

Source: Detecon

Telecoms are working "multinational". International telecom groups like Deutsche Telekom, Vodafone and Telefonica are well known in the global telecom space, but they produce and operate networks and services as an accumulation of national businesses with very limited scale effects across countries. Talking to executives in the industry, biggest synergies still come from supporting processes like joint procurement, building "reporting factories" or consolidated HR operations.

This is also reflected in the numbers. If you look to profitability in relation to size of an operator there is a clear effect within national markets: The average telecom market leader in Europe has an EBITDA margin of 38% while the average 3rd biggest player has only 28%. Looking across national borders the picture is different. The average telecom group in Europe with more than 4 subsidiaries has an average EBITDA Margin of 32 %, while a small players with only 1-2 subsidiaries have an average of 36 %.

The conclusion is clear: Looking at profitability – on an international – scale size doesn't matter! Size only matters within national markets today. Transferring this statement exemplarily to the automotive industry it would mean: A small national car manufacture is in average more profitable than a big, global automotive giant. Sounds odd.

Nevertheless, the industry has tried to yield benefits of internationalization and size. Since almost a decade, experts in telecommunication group headquarters are trying to create "group effects". Shared Service Centers, Knowledge centers and international brands are "must haves" on the leading CEOs agendas of the industry. Only success is limited so far. Key driver for profitability is still the market environment. Tight regulatory regimes and markets with multiple players squeeze profits and vice versa. In contrast, "group effects" play only a subordinated role. Given the pictured numbers it's even worth: Big means less profitability!

The underlying key reason is simple: The benefits created in groups do not compensate for the resulting increase in the management of organizational complexity that accompanies multinational telecoms. As said, synergies are mainly created in supporting areas, such as procurement. The heart of telecoms – the network and service production, products, sales and customer service – are so far not part of synergies beyond best practice sharing.

Due to the national set up of the business, the effort required to centralize network and service production is immense. The telecom business is nationally grown all over the world. Looking even in central Europe – 20 years ago Telecom's where run as governmental infrastructure agencies. The "national roots" are not only still inherent in the culture of the operators, but also in the technology, processes and products.

Even if products and services look very similar from country to country at the first glance, features, production platforms and processes are quite different. For example, systems and the process to perform a simple call are historically grown and significantly differ between countries. It is simple for the car industry to centralize production, while having similar boundary conditions and market requirements in all countries. However, for telecoms, requirements, products and thus service production are national. Differences in processes and systems cause immense complexity if it is tried to centralize them on multi- or international scale. The missing benefit to work in an international group structure leads to a scattered industry. Small companies serving relatively small markets can survive well in local markets. Only in Europe, more than 160 fixed and mobile players are competing today in the local markets, while 87% of them serve less than ten million customers in total. Taking into account that advanced services like IPTV require an estimated minimum market size of 20-30mn customers to compensate development and integration costs, the challenge the industry has is obvious.

Suppliers and OTTs can use global market power

In contrast the situation below and above service providers in the value chain looks different: the supplier and over-the-top player (OTTs) market is significantly more consolidated. Using resulting scale effects, these players can use their market power to more and more increase their share in the value creation. Upstream, equipment and service suppliers actively drive consolidation and globalization since the past decade. Nobody would consider Cisco, Huawei or Ericsson to operate like regional or even national market players, following local market requirements. Their products are developed, produced and sold on a global scale, allowing suppliers to effectively leverage their market power to create global market entry barriers. Currently ongoing mergers and acquisitions will intensify market concentration across all segments. Prominent recent examples are on the one hand Nokia's 16.6 billion$[1] acquisition of Alcatel-Lucent that has put 80% of the market for radio access networks (RAN) in the hands of only three vendors. On the other hand two of the most dominant players in the market – namely Cisco & Ericsson – are currently under discussion to form a strategic partnership that is supposed to generate an incremental revenue of 1 billion$[2].

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[1] *http://www.finanznachrichten.de/nachrichten-2016-02/36409171-nokia-to-hold-91-in-share-capital-of-alcatel-lucent-after-offer-settlement-020.htm* .

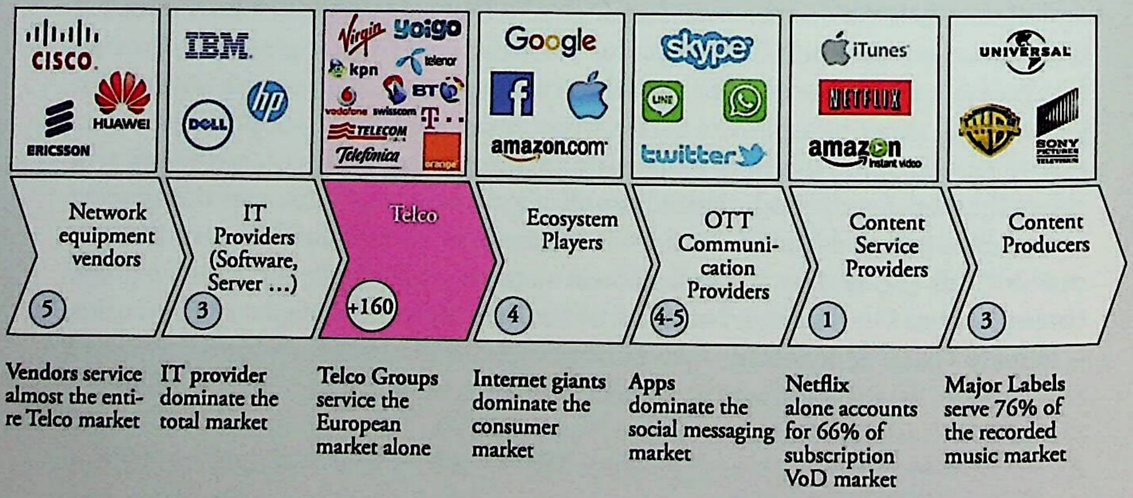
[2] *http://www.forbes.com/sites/greatspeculations/2015/11/10/heres-what-cisco-and-ericsson-could-gain-from-their-alliance/#28aec4046f0f* .

The rationale behind these two examples remains the same: the ability to spread cost on a global scale has become detrimental for the success of a company.

Downstream, OTTs worked from the beginning with the ambition of global scale. The main wisdom to judge an investment opportunity in "the valley" is the scalability of the business model: To just name a few operators such as Facebook, WhatsApp and Google offer the same service beyond any local market requirements with little customization worldwide. The only market customization that is usually done is language. New features developed are rolled out internationally. Once they are centrally implemented, in principle "the light goes on everywhere".

The difference to the national approach of Telecoms can't be attributed only to the genius of the entrepreneurs in the new economy. Telecoms facing a regulatory and legal regime that has created the scattered industry structure in the first hand. In contrast to most OTTs, telecommunication companies have to comply with national laws, license obligations and rules. Many services offered are directly regulated in price and scope; specific interfaces and processes need to be provided to cope with national Telecom Operator obligations which forces Telecoms to have national productions. Regulation, once set up to increase the efficiency of the industry, is now an obstacle for cross country synergies. On top, Telecom operators are often publicly owned or governments still have a (veto) say. The stories of local governments intervening if Telecom groups try to consolidate production of selected services like voice are well known in the industry. Reasons are not only the fear of cutting back jobs, but also concerns of national security

Figure 2: Diversity versus Concentration


Network equipment vendors
5
Vendors service almost the entire Telco market
IT Providers (Software, Server ...)
3
IT provider dominate the total market
Telco
+160
Telco Groups service the European market alone
Ecosystem Players
4
Internet giants dominate the consumer market
OTT Communication Providers
4-5
Apps dominate the social messaging market
Content Service Providers
1
Netflix alone accounts for 66% of subscription VoD market
Content Producers
3
Major Labels serve 76% of the recorded music market

Source: Detecon

and data privacy. Autonomy and direct access to the telecommunication services is regarded mandatory by many governments and intelligence services to ensure control in case of crises and supporting law enforcement agencies.

"Pan" or why the telecom business must become international eventually

History shows, the starting point for change is often a combination of pressure, vision and new technological opportunities. In case of the telecommunication industry, it seems that everything is in place. If not to say the change is mandatory to survive. In Europe, pressure comes from the regulatory side and from OTTs entering "Telecom terrain". The EU commission, has put forward a regulatory framework for electronic communications that is comprised of a series of rules which apply throughout the EU Member States. The common goal is to establish a "cross-national telecommunication markets", opening the door for European Telecoms to make European offerings. The most prominent example is probably the abolishment of the roaming business starting on June 15th 2017. However aside the negative impact on revenue this will create on the customer front end what is so far missing in the production and operations of a telecom: A Pan European market.

Besides, OTTs are entering with their services the "classical telecom terrain". For example voice and messaging are pushed by WhatsApp and Apple and other players. The eSIM adds to the cocktail. Compared to Telecom operators these players have today a significant structural advantage if it comes to services: They can leverage their size. With a team of 50 engineers[3] WhatsApp develops features and services that are rolled out step by step worldwide. WhatsApp doesn't need individual technical implementations in each country and handle different legacy systems. WhatsApp implements it once and seamlessly 1 billion[4] customers will benefit from the new feature. That makes them agile and efficient.

The shackle for Telecoms is their heterogeneously grown network and service production and the corresponding national processes and service portfolios: For example, Deutsche Telekom AG alone uses in Europe more than 10 different platforms for messaging and operates more than 50 data centers The picture in the other mayor Telecom groups looks similar. Investments needed today to keep this heterogeneous technology portfolio up to date is immense. New features and services need to be implemented "country by country", while benefits of the "national customized approach" are marginal.

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[3] *http://www.wired.com/2015/09/whatsapp-serves-900-million-users-50-engineers/*.

[4] *https://blog.whatsapp.com/616/Eine-Milliarde*.

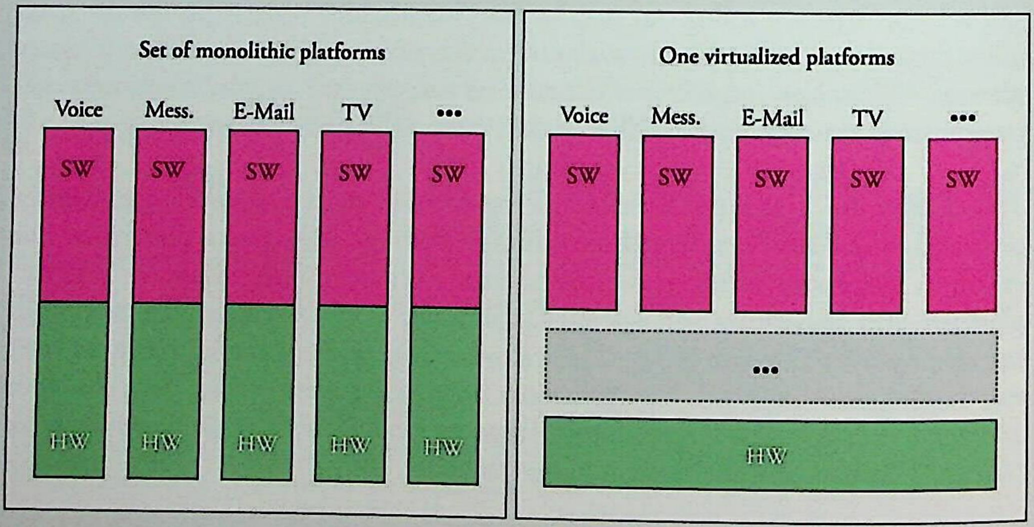
It's clear that Telecoms – with all the advantages they still have over the OTTs – need to get structural on eye level with those competitors to still have a say in high scale services like voice, messaging or TV in the future and have the chance to establish new ones. Telecoms need to build up international productions if they don't want to withdraw from the service business and become pure bit pipes.

Telecom production on the journey towards software, standardization and international scale?

Today, telecom production is set up as monolithic pieces of hardware and software. Vendors deliver individually configured appliances satisfying the requirements that are maintained through software updates over the lifecycle. A senior manager of Deutsche Telekom puts it this way: "Data Centers of Telecom Operators – the heart of service production – often look like big garages with all kinds of cars from Kia, Toyota, Audi and Ferrari. All cars have different colors, are differently parked and need different fuel. Going to Google, we see VW Golfs all having the same color, having the same engine, using the same fuel, all parked precisely".

Exemplary, the integration of new or interconnecting between services – such as connecting the TV platform with messaging service to enable "on TV messaging" – is complex and resource intense for telecoms. The disadvantage becomes clear

Figure 3: Virtualization Challenge



Source: Detecon

when transferring the situation to the consumer world. Imaging of owning and maintaining a dedicated laptop for every application that is used today on a laptop: One device for preparing documents, presentation, tax reports, emails etc. In order to send an email directly from your text application you first have to build and maintain a dedicated interface and involve an integrator, potentially suppliers of both application.

Unsurprisingly, the one current big technology trend in the industry is "softwareization" better known as Network Function Virtualization or simply virtualization. Telecoms want to use "common of the shelf" hardware that is independent from the applications running on top and available as shared resource pool for all applications. Applications and their instances are automatically managed and provisioned according to resource needs. The advantages of this approach are clear:

"Fast and cheap" introduction of new products and features: New services can be easily introduced at low costs. In case the service fails commercially, licenses are canceled and hardware is used for other services. In doing so, Telecoms can test more innovate services and implement a fail fast approach.

Load peak optimization: Having a common hardware basis, the utilization of resources can be optimized across all services. In case of a load peak, for example 12am on New Year for messages, resources that were used a few hours before to produce other services, such as TV, can now be used for the service with peak load.

New production schemes: Using the same resources, Data Centers can be overdimensioned. In case hardware breaks, components are simply deactivated and replaced in later, large maintenance cycles.

Reduced cost for computing power: Using standardized hardware, same computation power can be bought at significantly lower costs.

More competition on supplier side: Building service as software lowers the market entry barriers for new vendors. This reduces production costs, enable new licensing models and innovate services.

This could solve many problems telecoms are facing today, especially in the competition to OTTs. Time to market and cost for new products would be reduced

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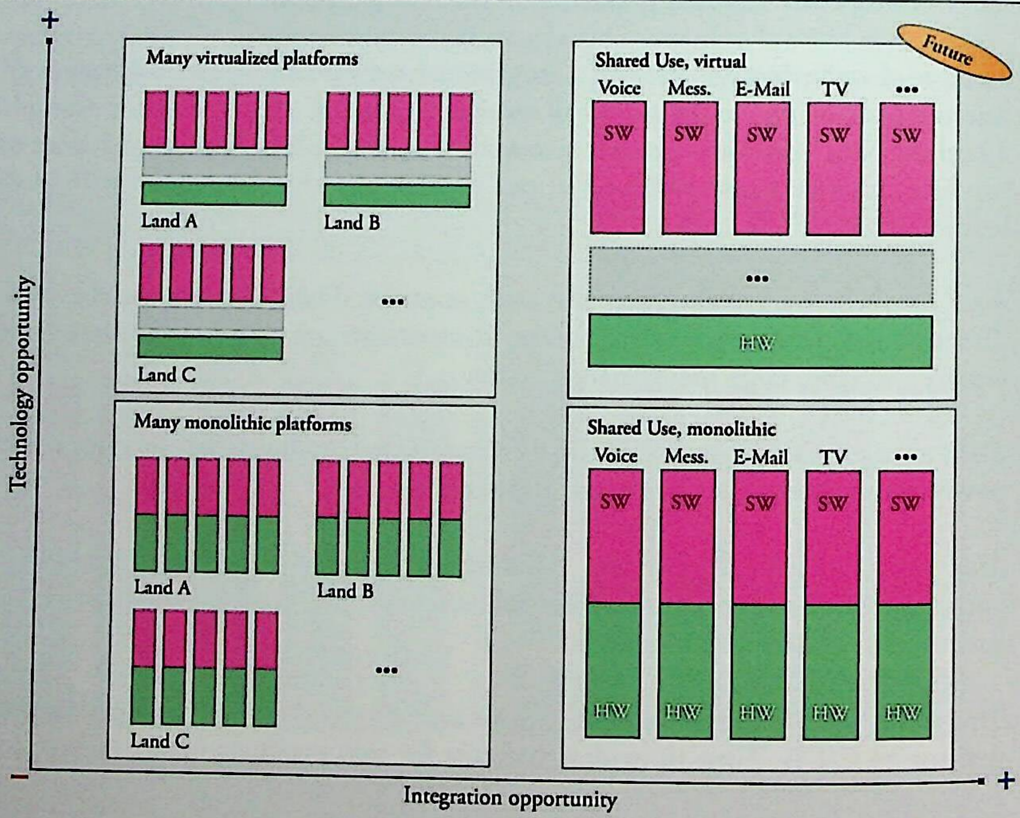
5 *Also called Software Defined Networks /SDN and Network Function Virtualization / NFV).*

significantly. The easier integration among services makes automation of multiple processes possible that are manual today. And most important: The "cost for failure" gets smaller and therewith innovation easier.

As transparent as the advantages as big is the transformation challenge. To integrate the today scattered, monolithic and vendor specific systems in cloud based, software driven factories means to execute standards and harmonization. To simply transfer the very individual and customized telecom production of today into the new scaled, softwareized "factories" would mean a hugely complex development exercise. Everything existing today would need to be rebuilt as software. Telecom operators must understand that the "bouquet" of national customizations is not required. Nobody would expect "Skype" – a famous OTT messaging and calling service – to look different in Athens than in New York – except the language. Looking exemplary at the different IPTV services within Deutsche Telekom: Local customizations exist even in the smallest countries. The result is very limited customer impact but huge cost.

Figure 4: Integration & Technology Opportunity


+
Many virtualized platforms
Land A
Land B
Land C
...
Future
Shared Use, virtual
Voice
Mess.
E-Mail
TV
...
SW
SW
SW
SW
SW
...
HW
Many monolithic platforms
Land A
Land B
Land C
...
Shared Use, monolithic
Voice
Mess.
E-Mail
TV
...
SW
SW
SW
SW
SW
HW
HW
HW
HW
HW
Technology opportunity
–
Integration opportunity
+

Source: Detecon

With this need of simplification to get to the "software age" comes a huge opportunity for telecom groups. The need for simplification eliminates the mayor hurdle for "international production" in the past – complexity. All operators want to get the benefits of moving towards software. But for telecom groups the chance is to use this step to integrate across countries (having to anyway standardize services to move to the software world). It would be a revolution since size and being truly international could suddenly matter in the telecom operator space.

Having telecom groups producing services centrally (e.g. TV) the development cost could be reduced dramatically, since services need to be developed and implemented only ones instead of for each country. The speed to scale (time from idea to having service launched in multiple markets) would be a fraction of what it is today. Cost to maintain and operate services can be expected to be reduced significantly. But most important, Telecom groups get over the production disadvantage they today have compared to OTTs and get in the position to attack.

Furthermore one additional opportunity is opening up if going this direction. Cross country synergies in the cost and resource intense telecom customer processes always failed in the past, because the underlying complexity in the production made efforts like process standardization and joint outsourcing across boarders merely impossible. For example a trend to build joint CRM systems in big telecom groups did not yield the expected benefits exactly due to this underlying complexity in the production. Having integrated production factories is opening up a huge space of further optimizations that can bring telecoms group a significant scale advantage in the future.

But change will not come "just like this". Executives in the industry need to drive the organization towards international!

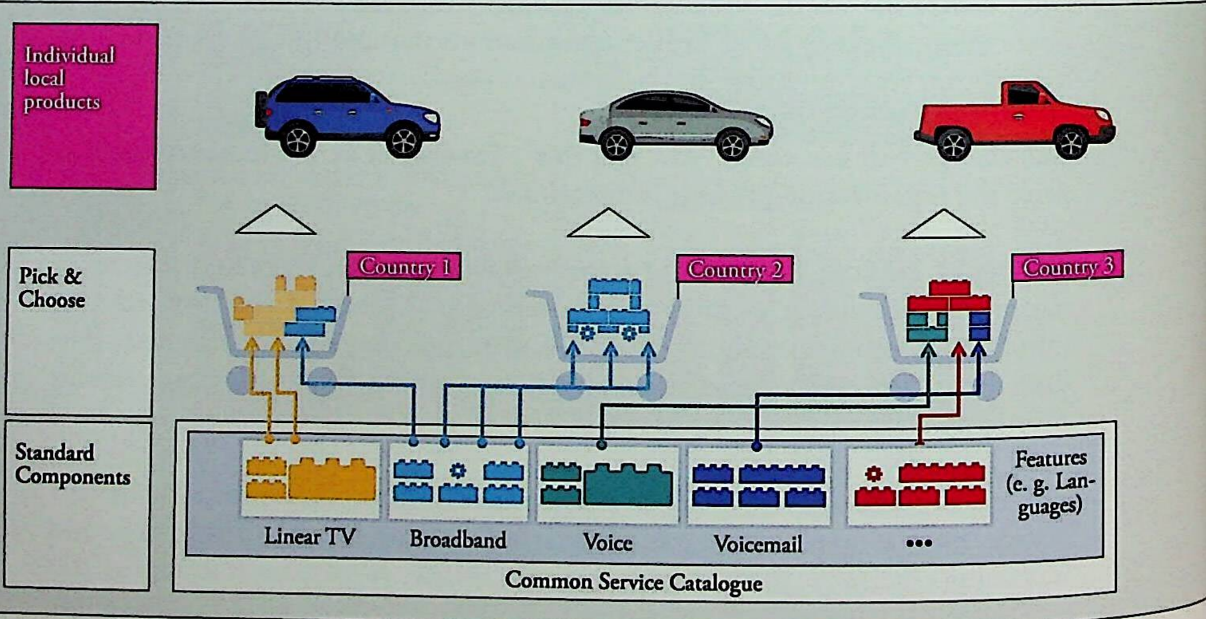
Talking to Telecom CxOs about transformation you can feel a very common, narrow understanding of quite narrow terms: benchmark driven cost cutting, outsourcing, process optimization and automation, simplification are the common terms. The topics are well known, executed repeatedly and the organizations have learned how to deal with them.

Telecom organizations especially in mature markets have been squeezed in the last decade. But the optimization is still driven in functional silos by cutting scope and increasing efficiency. The way how Telecoms "think" efficiencies is driven by this experience. In the technology domain for example the biggest efficiency trends in the last years was the outsourcing of maintenance and engineering services to former equipment suppliers that drive a "forward integration".

To become "international" Telecom executives need to transform first their thinking patterns. Bringing Telecom from multi-national to international means to overcome "thinking improvement in the function and country". You cannot centralize one function without pivotal impact on other. If for example, like Deutsche Telekom does, the network and service production is centralized into one factory, the impact on commercial is tremendous. You can only sell what comes out of the factory – meaning if you centralize the production of ten countries into one, the freedom to sell in every country different services is gone. So the challenge is how to align between central production and local market demand. To be more specific: The marketing and the technology side need not only to find a common language, but also a common structure to steer what is produced and sold.

Production-structure wise there is a lot to learn from other industries that managed to serve markets "customized", still having international scale in the production. Modularization is the key in the automotive industry that enables the Volkswagen's and Toyota's of this world to build different products out of the same components. The way to internationalize the Telecom production points in the same direction. Producing centrally components that can be used in multi-

Fiugure 5: Scaled Production for Local Products through Modularization



Source: Detecon

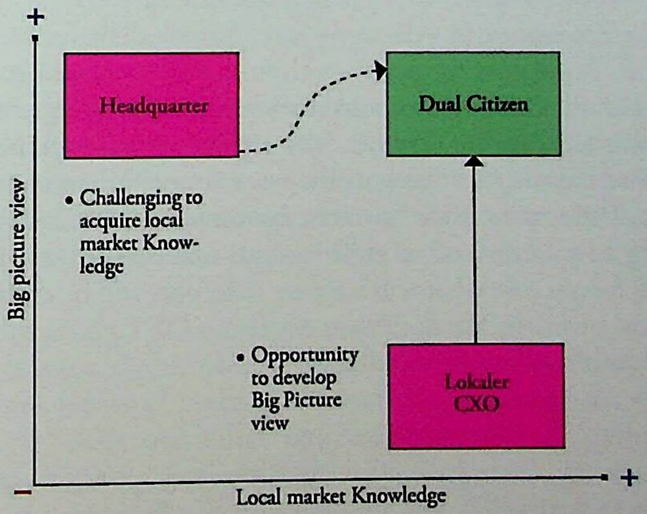
ple different product bundles with different configurations is the way to enable centralized scale and keep the local ability to customize towards market needs.

The governance to lead the change is trickier. The real business – in terms of producing and selling services – is national today. This means also the pivotal business knowledge is local. In here comes one major mistake that we have seen multiple times in our careers that needs to be avoided: Looking across industries the usual reflex of big corporations centralizing activities is: The central builds the central!

The challenge is to drive the conception and implementation by having both ingredients equally: The strategic "big picture view" of a head quarter and the local market knowledge. A "combinatory role" is needed that is integrating both views. The way is to go from "local business knowledge" to the strategic view. The learning and experience effort needed to make strategist understand the national challenges and structures is much higher than vice versa.

Deutsche Telekom approached the challenge by making CxOs from national subsidiaries "dual citizens". The leader role to build a part of the "central factory" was added to their regular role as a functional leader of a subsidiary (e.g. CTIO for Hungary leads also a part of building the central production). This solved several challenges that a Telecom faces on the journey from national to international production:

Figure 6: Transformation Challenges


+
Headquarter
Dual Citizen
Big picture view
• Challenging to acquire local market Knowledge
• Opportunity to develop Big Picture view
Lokaler CXO
–
Local market Knowledge
+

Sourcee: Detecon

> Prevent *„Not-invented-here"-Syndroms:* The acceptance of a central factory in local subsidiaries – that actually do to the business – is success critical.

> *Pragmatism and speed:* Local business leaders know what is needed in the markets and they prioritize "implementation" over "conception".

> *Perspektive:* Local leaders need the perspective to get a role in the "central". By the nature of things – centralization means take something away from the local. The fear to lose power on the local side is given.

A tactful approach towards national governments is key to get their support

Talking to national authorities and agencies one can get the impression that centralization of telecom assets is an impossible undertaking. Two concerns are repeatedly raised when talking to government officials:

1. Lawful Interception (LI)[6]: Having the production of telecom services (e.g. voice) outside national boarders authorities fear to lose the access to data that is pivotal for their national security. Besides, countries hosting the production for many countries could have access to traffic data from other countries (e.g. location of data center producing the services).

2. Critical Infrastructure: The control over telecom services are of special importance in case of a national crisis. Having not full control of telecom services in the case of war for example could be a critical disadvantage.

National governments are in a dilemma here. Almost all mature telecom markets are liberalized. Regulators foster competition, in Europe even roaming charges get abolished at all and one European market is created commercially. In a nutshell, telecoms are pushed commercially to tear down national borders and therewith loose roaming revenues, at the same time OTTs steal more and more of the classical telecom service business. National authorities prevent telecoms from reacting adequately and to shift towards scaled production. Keeping this direction it is foreseeable what will happen: Telecoms will be reduced to be pure "bit pipes" and primarily the dominant American OTT giants will dominate the former classical telecom service business.

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[6] *Lawful Interception (LI) is obtaining communications network data pursuant to lawful authority for the purpose of analysis or evidence.*

[7] *Average Return Per User (ARPU).*

But – and this is the dilemma for the national governments – the briefly described scenario can be the last thing local authorities want. Having Telecoms at one point really giving up on their classical service business means for national governments the access and control over telecom services is gone. Not because it's moved to a close by country, but rather because it is terminated at all. The beginning of the process can be already observed in countries with low ARPUs[7] and strong competition. Discussions if it makes sense to continue services like SMS for or to better terminate the service at all and simply offer an OTT alternative get more and more common.

Rational acting national governments should be therefore open to negotiate and agree on trades that secures them control, but doesn't prevent telecom from reacting. That this will not happen without education, pressure and intense lobbying from the telecoms side is also clear. Telecom executives are still the master of their destiny. But they have to start acting on this right know. The time window is not endless and the sooner this hurdles are settled, the better are the chances that the industry is not reduced to a "pipe with bits in it".

The centralization and internationalization of the telecom production will have a bigger impact on the telecom organizations than the mega trend "IP" had

Standalone telecom operators and small groups will be hit by the structural change of the industry. They are facing a more difficult situation compared to today. The pressure from the OTTs on their service production will stay but at the same time the telecom groups are about to gain a structural advantage as well. The result will be a further reason for accelerated consolidation in the telecom business.

The big telecom groups will transform and centralize their productions in the next decade and close the structural gap to the OTTs. With this will also come a revival of the telecom operator as a service producer and innovator: The key asset a telecom has today – the long lasting customer relationships – will exponentially increase in value when telecoms have services in the portfolio on eye level with the global OTTs.

But the transformation the big telecom groups have to undertake are a challenging endeavor. It's not less than creating international organizations out of multinational ones. It needs brave and powerful leadership to drive the change and new approaches how to overcome the transformation hurdles (e.g. "Dual Citizenship"). But eventually big telecom groups will have a say over "the water in the pipe" as well. ■

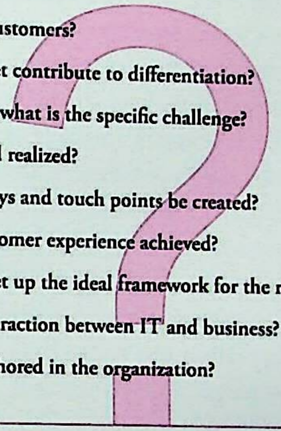
Telekom Goes Digital: Highlights of the Change Dimensions

Dr. Andreas Lischka, Michaela Wolfering-Zoerner, Ann-Kathrin Stender, Uwe Kunz

> Telekom takes the challenge of digitalization by the use of a group-wide strategic target image and program. The goal is to continue to put customer needs at the center.

> In particular, the strategic alignment of sales and services enables a competitive and value-driven omnichannel management. Telekom would thus correspond to customer demand for unified and consistent interactions at all touchpoints and in all customer journeys.

> The resulting necessary internal changes are promoted by Telekom Management on agile teams, which are controlled top-down.



A. What does digitalization mean for customers?
B. How can digitalization on the market contribute to differentiation?
C. What does this mean for Telekom – what is the specific challenge?
D. How is the digital vision defined and realized?
E. How can successful customer journeys and touch points be created?
F. How is a seamless omnichannel customer experience achieved?
G. How can organization and culture set up the ideal framework for the realization of the digital agenda?
H. What must be considered in the interaction between IT and business?
I. How is the subject permanently anchored in the organization?

By now, word has certainly gotten around to everyone that digital transformation is a major topic of discussion in all industries and on all markets. A recent study confirms this, and the Ministry of Economics has also responded to this transformation with its "Digital Strategies 2025"; the objective is to provide models in support of midsize businesses, SMEs (small and medium-sized enterprises), tradespeople, and the service sector during digital transformation. VDMA chief executive Brodtmann said: "Silicon Valley can certainly get a lot of things moving, but Industry 4.0 as a subject of the future in industrial manufacturing has to do with all of us."[2]

Customers and markets in the age of digitalization

Changes can also be sparked by customers themselves, however, because digitalization is changing customer behavior. The telecommunications industry was confronted with this at a very early point in time with the use of social networks like Twitter and Facebook in communications with customers or the shift from text messages to WhatsApp. But other industries are taking an increasing interest in the new technologies so that they can successfully deal with the change in customer behavior.[1] The example of Kodak vividly demonstrates what can happen if a company waits too long. As the digitalization of photography progressed, this company went through a number of restructuring processes, sales of business divisions, and strategic reorientation. The number of employees declined dramatically. Kodak today focuses solely on the sectors of professional photo finishing and printing.

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1 *Cf. Sinn, Walter (2015). Digital-physische Transformation Wie Unternehmen «digitale» Strategien erfolgreich umsetzen. Organisationsentwicklung 15(3), pp. 11-13.*

2 *Cf. Beginning of the Year 2016. Four Questions for VDMA Chief Executive Thilo Brodtmann 06/01/2016 | id:11481238.*

Technological developments and innovations lead today to the close intertwining of service and sales channels with one another. But these developments also produce higher expectations on the part of customers. Companies must respond strategically to these changes and drive forward the subject of digitalization in sales and service. What is more, omnichannel management – the interplay of sales and service across all channels – is of vital importance for remaining competitive on the market.

A study conducted in 2015 by Nice, one of the world's leading providers of call center IT, examined behavior patterns in the use of media in customer service. It revealed that customers today often use more than one customer service channel to resolve their issues. On average, a customer will use 5.8 of ten available channels to establish contact with the companies. Moreover, the study showed that one out of three customers uses self-service opportunities in an attempt to find answers to questions. If this is not possible because of inefficiency or discontent, they will move to a different channel. Self-services and their quality are becoming increasingly valuable criteria for customers and their satisfaction.[3]

Telekom is hard at work implementing digitalization within the framework of various initiatives and programs so that customers' insistence on being able to access products and services at any time and from anywhere can be satisfied.

Various change dimensions as a challenge of digitalization specific to Telekom

Deutsche Telekom is determined to stay abreast of these well-known developments on the market and to provide the cross-channel digital interaction with the provider that customers have come to expect; to do so, it has defined a vision and program entitled "Telekom Digital". This program contains the specific answer for Telekom and outlines how the company must handle the challenges posed by digitalization. The digital vision that has been set forth and applies throughout the corporate group will be realized by 2018. It encompasses nine concrete imperatives that define the "What?" and "How?" of the digital road map. It will be regularly reviewed by the Management Board and senior management of Telekom Deutschland to ensure that the vision becomes reality. The financial effects will regularly be examined by these bodies as well.

The digital vision will be the guide for the interaction with private individuals as well as business customers at Telekom Deutschland. Telekom is positioning itself

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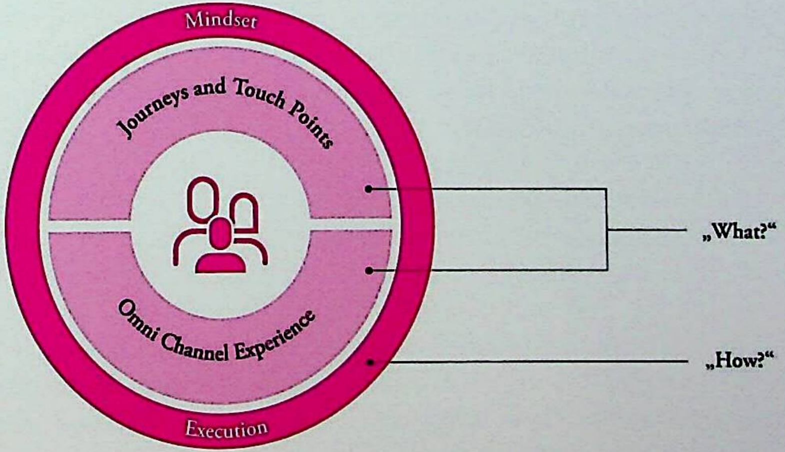
[3] *Cf. Mustica, Sabina (2015). Kunden glücklich machen. Acquisa 15(62), pp. 68-69.*

in the business customer segment as the digitalizer of midsize businesses and large corporations. This positioning implies enormous internal changes. Anyone wishing to be a credible digitalizer must itself be digitalized.

Shaping digital transformation means having to think, work, and even lead "differently". These change dimensions describe the digital vision for Telekom in particular. The framework needed for these changes is created by the "How?" regarding mindset and execution of the inner transformation and the "What?" that addresses the relevant subjects for customers and the resulting points of action for Telekom in terms of the customer journey, touch points, and the omnichannel experience.

The factors for the successful realization of the digital vision along the points of action and for the clarification of conflicts among the various stakeholders include the creation of the position of a CDO (chief digital officer) as well as "multi-speed business" and IT to guarantee fast and efficient delivery. McKinsey has determined the same success factors for the implementation.[4]

Figure 1: Digital Vision of DTAG



Source: Telekom Deutschland GmbH

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[4] *Cf. Dörner, Karel & Meffert, Jürgen (2015). McKinsey, Article „Nine questions to help you get your digital transformation right", 10/2015.*

The change dimension "What?" in the digital vision

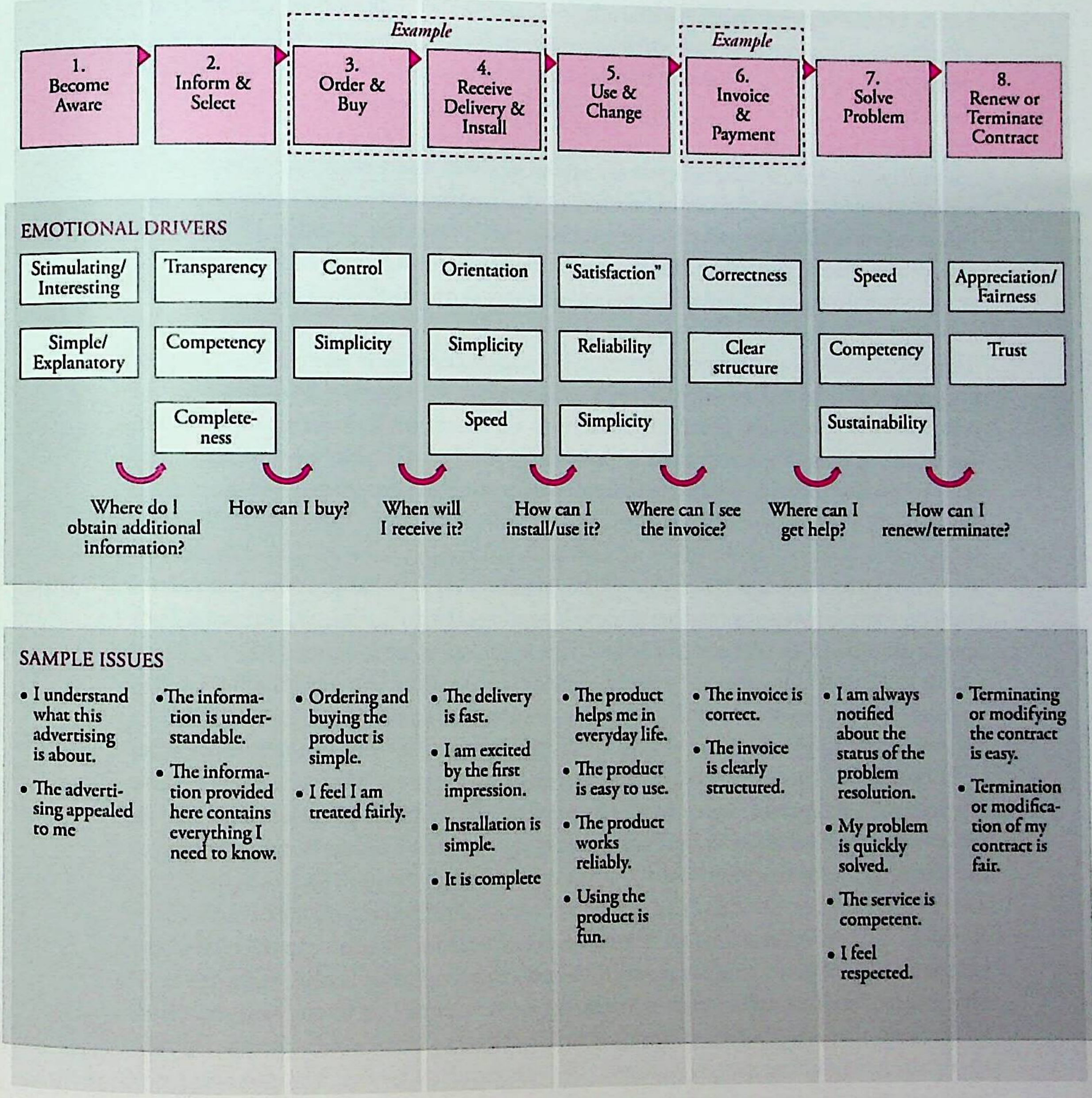
The goals of the "What?" along the digital road map are individualized customer journeys, consolidated interactions, and experience for customers that is both consistent and intuitive. Individualized customer journeys generate a competitive advantage when a 360° view is provided on all customer contact points, whether based online or offline, and across all sales and service channels – obviously with due regard for the security of customer data. If we take Netflix as the benchmark, we note in particular that this company understands not only how to gather and analyze relevant customer data, but also how to use this material as a foundation for addressing specifically customer needs that make the relevant difference. The best practices for individualization at Netflix illustrate to us that a definition of the relevant seamless customer journeys across all channels, including shops, and the identification of a set of measures for individualization at the digital contact points along these customer journeys are necessary. A function of this type for the German market was launched on a personalized website (Telekom.de) earlier this year.

Drawing on this source, the customer journeys are being systematically examined and used as blueprints at Telekom Deutschland. This procedure is being followed to analyze where customers today abort the customer journey and experience problems. Interviews with experts and assessments are used as a basis to determine where customers find themselves blocked on a digital channel or e-channel or do not receive adequate information. These are the points that prompt customers to call the hotline, for example, incurring personnel expenses to provide hotline service. If we take the customer viewpoint for the customer journey in the e-channel, we find three points in need of improvement:

1. Ordering and purchasing
2. Receiving delivery and installing
3. Viewing invoice

To start with, the ordering and purchasing process is created in a new "responsive design". Customers today no longer use primarily their conventional PC to open the Telekom website, but instead utilize smartphones and tablets with touch screens as their browsers. This is why it is very important that the contents of the website be dynamically optimized for all devices – the website automatically adjusts so that it is properly displayed on an iPhone, a tablet, and a PC. Customers do not have to accept any technical and visual compromises regardless

Figure 2: Customer Journey



		Example			*Example*		
1. Become Aware	2. Inform & Select	3. Order & Buy	4. Receive Delivery & Install	5. Use & Change	6. Invoice & Payment	7. Solve Problem	8. Renew or Terminate Contract
EMOTIONAL DRIVERS							
Stimulating/ Interesting	Transparency	Control	Orientation	"Satisfaction"	Correctness	Speed	Appreciation/ Fairness
Simple/ Explanatory	Competency	Simplicity	Simplicity	Reliability	Clear structure	Competency	Trust
	Completeness		Speed	Simplicity		Sustainability	
Where do I obtain additional information?	How can I buy?	When will I receive it?	How can I install/use it?	Where can I see the invoice?	Where can I get help?	How can I renew/terminate?	
SAMPLE ISSUES							
• I understand what this advertising is about. • The advertising appealed to me	• The information is understandable. • The information provided here contains everything I need to know.	• Ordering and buying the product is simple. • I feel I am treated fairly.	• The delivery is fast. • I am excited by the first impression. • Installation is simple. • It is complete	• The product helps me in everyday life. • The product is easy to use. • The product works reliably. • Using the product is fun.	• The invoice is correct. • The invoice is clearly structured.	• I am always notified about the status of the problem resolution. • My problem is quickly solved. • The service is competent. • I feel respected.	• Terminating or modifying the contract is easy. • Termination or modification of my contract is fair.

Source: Telekom Deutschland GmbH

of the devices being used and profit from consolidated interactions with only one home page based on end devices. In addition, ordering and purchasing processes on the market are today very simple, clear, and fast – customers must be able to fill a shopping cart and subsequently purchase the products with a "click". Previous customers in particular should not have to enter or confirm any information again right from their second purchase. Starting from this and other premises, we have designed and implemented a simple, clear, and fast purchase experience (see www.telekom.de/unterwegs).

In addition, we note what customers appreciate when receiving an order in other online shops such as the simple review of their past orders and a track and trace function that makes it possible for customers to locate the position of the order at any specific time. These functions of viewing recent orders and tracking and tracing will in future be displayed in optimized form on the e-channel.

The third example, "Viewing invoice", satisfies customers' desire for a simple and clear issue of the invoice. An app that provides simple access to invoices for customers has already been implemented to meet this customer expectation. A corresponding function on the website is in the planning stage. Customers will be given a simple invoice view in the future that also allows the display of "jumps" in the amounts of invoices.

The examples demonstrate that the generation of ***consistent and intuitive customer experiences*** can create a new simplicity and the "same look and feel" across all customer contact channels. The application of a general "DT Design Guideline" and compliance with the guideline ensures the consistency of this customer experience across all of the contact channels. In the same vein, Telekom Deutschland is planning to realize a single login and, a simplification, to offer only one single invoice view. An optimal customer journey through the Telekom world is also being developed in the form of the virtual shopping cart that is used for all sales and service channels and assured by the optimized flow of the pages on the Telekom website.

Besides this, the cross-channel customer experience (omnichannel) and the prioritization of the digital or mobile customer contact channel are indispensable elements of a successful customer journey. New products must be e-enabled. Moreover, there is sensitization in the direction of online self-services within the framework of customer actions. The prerequisite is that the self-service is available for all of the company's own products as well as for partner products.

There is a balance between push and pull on the e-channel. A value-driven omnichannel orchestration gives customers the opportunity to act on their requests and needs on all channels. Silo thinking among the channels is reduced so that the omnichannel strategy ensures seamless customer journeys and consistent experience of good value for money that is optimized on all of the customer contact channels. One example is the setting up of appointments online. It is possible for customers to set up an appointment online for consultation in a shop and to keep the appointment at the agreed time.

The "How?" as a change dimension in the digital vision

The "How?" along the digital road map is aimed at the mindset and execution as required factors during realization. Digitalization through leadership from the very top means that management's leadership is visibly digital and that it motivates the organization and resolutely provides it with the appropriate resources by continuously defining and incentivizing digitalization as a priority in the company's business operations.

The appointment of a CDO clearly anchors responsibility and the agenda for the digitalization vision in the corporation. The CDO is in charge of both segments (TDG and EU) and reports directly to the CEO of each segment on the current status of digital transformation in all divisions. Core elements of digital transformation are one KPI (key performance indicator), the organizational structure and culture, and supporting incentives. The changes resulting from digitalization should become visible throughout the entire organization. One central digital KPI as an internal goal and one KPI as an external goal in the direction of the capital market help in communications. In this context, the CEO is definitely an important communications carrier as well.

Besides the central KPI, the CDO is also to be seen as change manager of the organization and culture who reports about the digital goals in the corporation and anchors and supports digital "evangelists" as promoters in the organization. Incentives aligned to the digital vision are assured consistently across all channels and management levels. Fast learning from customers is incentivized in particular. Design Thinking methods promote and encourage the taking of the customer viewpoint in all processes. All of the management levels – top management, middle management, and operational teams – profit from digital incentives. The incentive can, for example, break down silos existing in middle management in the sales and service divisions and promote cross-functional agile teams in operational teams. These agile teams are already supported at Telekom Deutschland, e.g., by Scrum teams.

Fast learning from our customers is possible only if customer insights are analyzed quickly and precisely and utilized according to relevance for customers by means of a continuous and iterative improvement process. From the starting point of initial customer hypotheses and minimally produced test products, it is possible to learn from customers and no longer to prepare a pre-defined, detailed product planning that is from the beginning defined in depth and stretching far into the future. Instead, the test products and their releases are quickly improved and strictly prioritized by cross-functional teams in response to customer feedback. Buying decisions are analyzed using IT and standard solutions are implemented. Initial initiatives for fast learning have already been launched in the German and European segments.

Digital analysis teams have been created in this way. In the future, TDG and EU will be expected to maintain digital analysis units that exchange synergies and are closely meshed with the CDO teams. The analysis teams essentially use three layers. In the front end, data about all kinds of customer interactions are recorded and collected in an integrated database, in turn analyzed and assessed by specialist teams, and returned iteratively to the data recording layer. The analysis results automatically flow into operations – for instance, into churn prevention in the current account management. TDG has already made use of customer engagement at digital customer contact points via the digital analysis team to create specific advertising with personalized contact points. Customers read an article about music and see the appropriate personalized advertising from Deutsche Telekom and Spotify, including a personalized website with the focus on Spotify products.

The consolidated user behavior across all of the customer contact points in an integrated data management platform enables an advanced analysis so that users and use cases can be addressed in e-sales and e-service. These users are utilized at all of the online contact points for personalization and advertising directed at specific target groups. In this way, a higher success rate for advertising directed at specific target groups is achieved and the personalized address of the customer leads to greater customer satisfaction.

Multi-speed business and IT, supported by exact customer analysis using big data, create another prerequisite for customer-centric improvements. So-called multi-speed business and IT become possible when front-end and back-end systems are decoupled and processed parallel to each other. A central API (application programming interface) management team can be set up to ensure that APIs are free of any redundant services and instable performance. Besides this decoupling, a structure that enables digital work at the best-in-class level and in which new processes and methods are developed that enable multi-speed work for Telekom must be created. Cross-functional teams, along with business and IT, support the fast realization, which ideally should be brought together for all digital products and services aimed at customers.

This decoupling also allows multi-speed in development. One example is Telekom Deutschland's new mobile portal. Along with the releases in the planning process, shorter release cycles with only a few, but flexible functions are created.

Improvements for customers in the direction of simplicity, efficiency, and speed-driven benefits also bring with them automation of sales and service transaction. This automation must be driven forward so that digitalization can be made possible. The advantages are unhindered speed during transactions and real-time data generation (e.g., for individualization), marketing specific to target groups, and efficiency where manual work can be reduced. Complexity is reduced by prioritizing existing products and processes. Products and processes are the primary drivers of complexity and costs. The reduction of complexity makes automation more flexible. Moreover, automation is to be extended to areas that have become economically meaningful because of the reduction of complexity. In the EU segment (Croatia is the first country), there is a pilot project for e-error repair via remote diagnosis as an example of automated self-service solutions. A virtual assistant offers support for technical problems; customers can eliminate the errors on their smartphones, tablets, and PC via IVR themselves.

Success factors for digitalization

Various critical factors must be given careful consideration if the challenges of digitalization are to be mastered successfully.

Digitalization must be lived top-down. The subject must be a key component of the corporate/company strategy, and the implementation must be steered by a central authority (at the beginning, at least). Cross-functional teams are required for strategic development and its implementation because digitalization impacts all levels of the added-value chain. Bringing "digitally gifted people" on board is very helpful so that the corporate group can learn from other companies. Another necessity is the intense further development of the company's own employees so that the major "capabilities" become available within the company.

This is supplemented at the top level with specific investments in technologies and experience for the further evolvement of the company (e.g., venturing).

The digitalization of products and services also demands a change in the way of thinking. Agility in product and service development along with continuous involvement of customers in development/further development of products and services help the company to offer error-free products and services tailored to customers. Moreover, adaptations can be made in shorter cycles.

The share of the clientele that contacts providers digitally will continue to rise. Accordingly, digital contact channels are even today of decisive importance, and they will become even more essential in the future. Sales and service must adapt to this change in customer behavior. Customers will decide themselves which channel they want to use for the resolution of their issues – advice in a shop, information from the Internet, or product reviews in social media, for instance. They will use a number of different channels, and that means that the same information must be available to customers at all of the contact points, whether it is information about a product or service or personalized offers. This is where advanced analytics can be of decisive importance in the use of stored customer information.

Digitalization also means driving further development forward in the operating units. Sales and service units will become increasingly digital – before the customer as well as internally. The relevant contact points before the customer must be filled. Customer concerns must also run through the company's processes automatically. What good is a "beautiful" website if the customer's order does not move through the process chain successfully in the customer's eyes? Business and IT must work together on this further development. Agile evolvement of the systems, automation, and ongoing trials with customers are required.

Culturally speaking, digitalization means setting a good example. Managers must be role models to their employees, living the culture of an open and flexible approach to changes. A culture of constant learning must be established in the company. Time and resources must be allocated to promote the ongoing further development of the workforce – without any concerns about possible failures and always with a focus on market and customers.

Some companies already have large reserves of capabilities. Now such reserves must be mined. A culture of trust encourages employees to find their own creative solutions to problems. New technologies for communication and collaboration – social media, cloud computing, and all the rest – generate tremendous potential for companies to simplify and accelerate processes. Enterprises should not hesitate to seize these opportunities and to implement them before the customer.

Deutsche Telekom can master the ongoing digital transformation by paying close attention to these success factors. The digital future will not change the determination of this company as a premium provider to continue striving to provide at all times the best customer experience.

A. Customers are changing their behavior in using the new technologies and expect various contact channels and self-services that are interconnected.

B. Individual and consistent customer journeys across all contact channels – online and offline – can contribute to differentiation on the market.

C. Groupwide realization of the digital vision requires "different" ways of thinking and working

D. Digital vision states concrete imperatives for the entire group in terms of "What?" and "How?"; they are realized in particular by a CDO and change management

E. Customer journeys and touch points are steered via the digital road map, individually designed by blueprints, and as a result offer customers uniform and consistent interaction

F. Value-driven omnichannel orchestration provides a consistent and optimized customer experience

G. Management leads top-down with agile teams and incentivizes thinking "differently"

H. Interaction of IT and business must be flexible so that customer insights can be successfully used promptly and iteratively

I. Targets anchor the digital road map permanently in the company

Dr. Andreas Lischka is the director of the Corporate Development division at Telekom Deutschland GmbH. He has had many years of experience in the telecommunications industry while working in the fields of technology, product management, marketing, and strategy.

Michaela Wolfering-Zoerner is Senior Expert Strategic Projects in the Corporate Development division at Telekom Deutschland GmbH. She has had years of experience in the telecommunications industry while working in the fields of marketing and strategy, especially CRM, segmentation, customer experience, service, churn (prevention), device portfolio, and pricing..

Ann-Kathrin Stender has held various positions since joining Deutsche Telekom AG in 2008. At this time, she is working in the department "Strategic Projects" in the Corporate Development division at Telekom Deutschland GmbH. Her focus is on project work for digitalization of the customer experience.

Uwe Kunz is a member of the department "Strategic Projects" in the Corporate Development division at Telekom Deutschland GmbH. He has had years of experience in the fields of strategy, marketing, sales, and e-business, especially in the area of international B2B.

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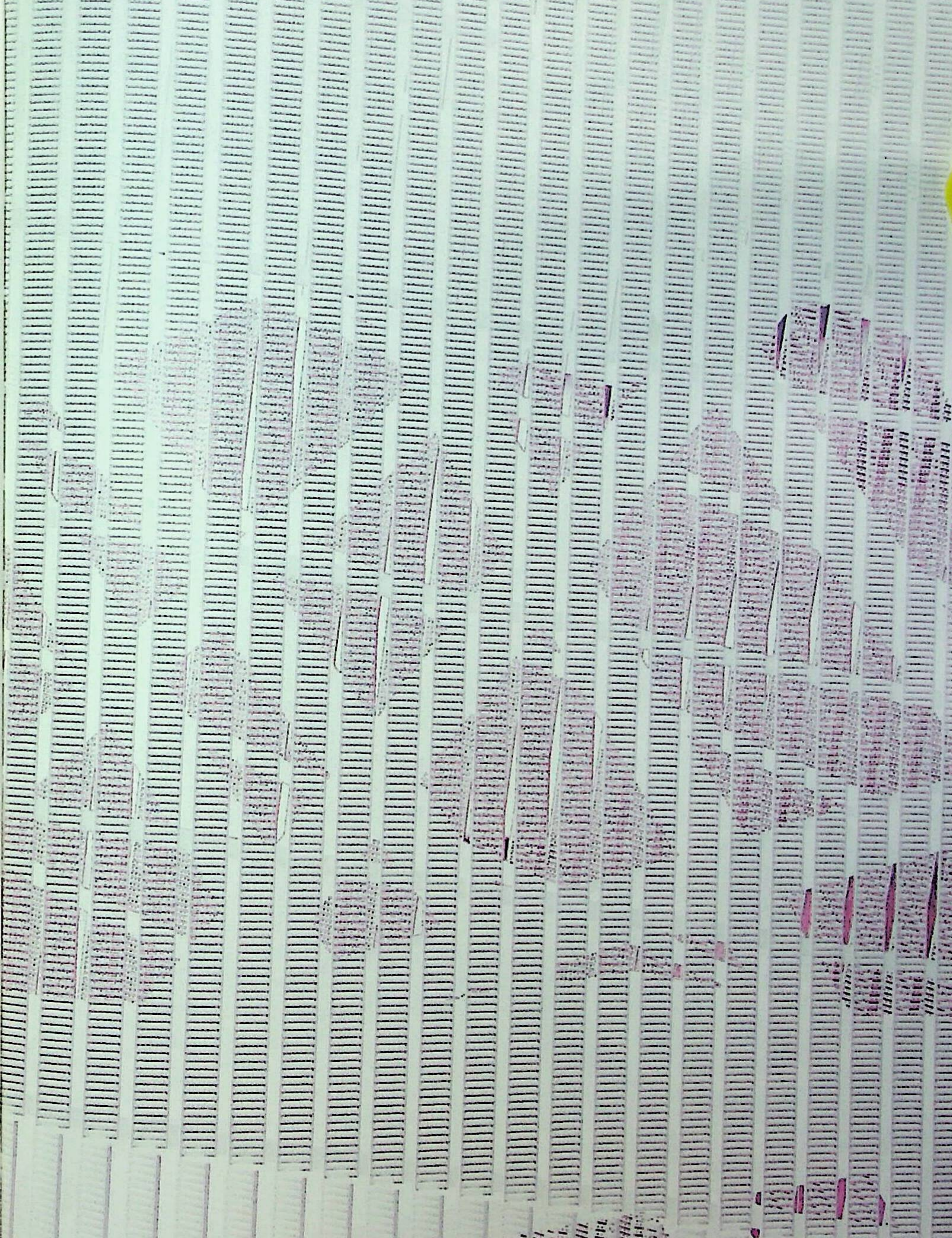


„The Best Overall Concept Will Win“

Buzzwords such as Industry 4.0 or Fourth Industrial Revolution stand for the significance of digitalization in manufacturing industry. The share of industrial production in Germany's economy is very high. That is why the topic is one of the top priorities for politicians and for companies in the manufacturing industries, carmakers, and their suppliers. This is true for **Dr. Jürgen Sturm, CIO at ZF Friedrichshafen AG**, as well: His goal is to make the mobility of the future secure, efficient, and sustainable through the use of groundbreaking technologies.

Interview

Question: What significance does ZF attribute to digitalization, and what role does the IT department at ZF play in this context?

Dr. J. Sturm: Digitalization, along with spreading urbanization and climate change, is one of the overriding megatrends that we as one of the world's leading technology corporate groups must face. Obviously, this topic has a major role to play in our corporate strategy. It has an impact on our activities in research and development, but of course the intensity of its effect on IT is also increasing. Digitalization is an important competitive factor in our products and services as well as in our business processes. These two aspects complement each other extremely well because intelligent products are being embedded in higher-level control systems more and more frequently.

Question: What megatrends with their origins in digitalization and connectivity do you see for the automotive industry?

Dr. J. Sturm: This is our clear objective: We want to use groundbreaking technologies to make the mobility of the future secure, efficient, and sustainable. The focus of our company's efforts is consequently on the topics of autonomous driving, security, and efficiency. In our position as system provider, we are able to offer a comprehensive portfolio covering precisely these areas to our customers. By intelligently linking mechanics, electronics, software, and digitalization, we create added value in our products and services that is tangible for our customers. A concrete example is the sector of intelligent transmissions that generate significant savings in fuel costs in the commercial vehicle sector and others. This is achieved through the networking of terrain information based on geo-data in interaction with data about the vehicle condition and a holistically optimized connectivity of engine control, transmission, and drive train.

Question: How is digitalization changing the internal production processes at ZF? Are these innovations related exclusively to gains in efficiency?

Dr. J. Sturm: Digitalization is changing the industrial world to such a substantial degree and broad extent that it goes well beyond any description as merely gains in efficiency for existing processes. This is true for core processes in development as well as in service or production. In addition, it influences management processes such as finance, governance, and support processes. At ZF, IT is evolving rapidly: with the virtualization of the processes, with globally connected communications and control systems, and the movement of Industry 4.0 into service business. In development, "digital prototype construction" and "virtual trial" join the shortening of development times to open up new approaches and prospects. And this transformation long ago reached our production facilities. Thanks to a process control and assistant system developed on the basis of Industry 4.0 methods, people and machines are working together in production in Friedrichshafen, Passau, and Sorocaba, for example. The system guides the employees working there and steers the smart tools and machines safely through the work processes to their goal – even during individual custom production with a lot size of 1. The work procedures can be adapted so simply that the people in production can do it themselves.

Question: What effect do digitalization and connectivity have on the products and services of ZF? Will they lead to new business models, and will there possibly be changes in established customer relationships?

Dr. J. Sturm: The key to our future success lies in the intelligent combination of mechanics and electronics. The mechanics provide the foundation – and we are making it more intelligent than ever before. One part of this is the connectivity within the vehicle. The other part is the connectivity of the car with other vehicles or with the traffic infrastructure such as traffic lights or traffic signs. Our product portfolio of ZF TRW contains the in-house technology that enables a vehicle to see, think, and act. Sensor systems such as cameras or radar are used for sight. The data from the sensors are brought together in electronic control centers – the thinking. And the brakes, shock absorbers, and all of the other connected components in our drive and chassis technology take care of the action. This is directly tangible for our customers. But we cannot today give a final and definitive answer to the question as to whether this will inevitably lead to new business models. Even though the growth of networking across the borders between industries is becoming increasingly obvious, I still do not believe that there will be any fundamental changes in our established customer relationships.

Question: Will the established market structures in the automotive and supply industry change because of digitalization?

Dr. J. Sturm: Digitalization is generating important impetus and bringing the familiar new players from the Internet age onto the market, where they are now moving in on established business. We are paying close attention to this development. And it is forcing us to look very closely and in detail at this new world. I am positive, however, that ultimately the winners in this competitive environment will be the ones who offer the best overall concept for meeting the needs of the market.

Question: Large telecommunications companies are not only involved with the implementation of digital transformation within their own walls; they also function as platforms for or enablers of digital transformation in other industries. What role do you see telcos in?

Dr. J. Sturm: It goes without saying that telecommunications companies function as innovators who make use of the competencies that have been their own for time immemorial to develop the technologies of tomorrow and the day after tomorrow that will be needed. Unless they make the research and development capacities for this purpose available and invest rather significant sums in their core business, however, they will not succeed. This is the only way for them to provide the basic technology that is indispensable for digitalization. Just think about the evolution of 5G technologies or the challenge (that still exists) of providing the most seamless, powerful network infrastructure possible – with full-area coverage, not just in densely populated urban areas.

In our core business, however, their role is more that of an enabler. In other words, they provide the functioning infrastructure on which we can build our systems. This is the basis for the transformation of the added-value chain into higher-value services for the telecommunications companies as well.

Question: What do you, speaking as a CIO, expect from telcos?

Dr. J. Sturm: As far as we are concerned, I would say that network connectivity is the pivotal element. We need reliable structures here so that we can offer our customers networked systems. The subject of data security is also of immense importance to us. Our intelligent products communicate with the outside world via telematics solutions. There must be guarantees that these sensitive data do not end up in the wrong hands. I am equally open to any and all other subjects that substantially and verifiably create added value.

Question: What success factors lead to viable cooperation between ZF and telecommunications companies?

Dr. J. Sturm: The long-term prospect of cooperation among interdisciplinary teams in a spirit of trust is important. Without it, we cannot ensure our ability to provide tailored, sustainable products to our customers. Since we are active in all of the economic regions of the world, the interplay of global and local framework conditions and prospects is of imminent importance.

Dr.-Ing. Jürgen Sturm, born in 1963, studied mechanical engineering with a focus on production technology and computer science. After receiving his doctorate, he held a series of executive positions for business process re-engineering and was division director for global supply chain management at Daimler Benz AG as well as CIO at Grundig AG. From 2003 to 2014, he was CIO at BSH Bosch and Siemens Hausgeräte GmbH. Dr. Sturm has been CIO at ZF Friedrichshafen AG, where he is in charge of computer science, since 2015.

■

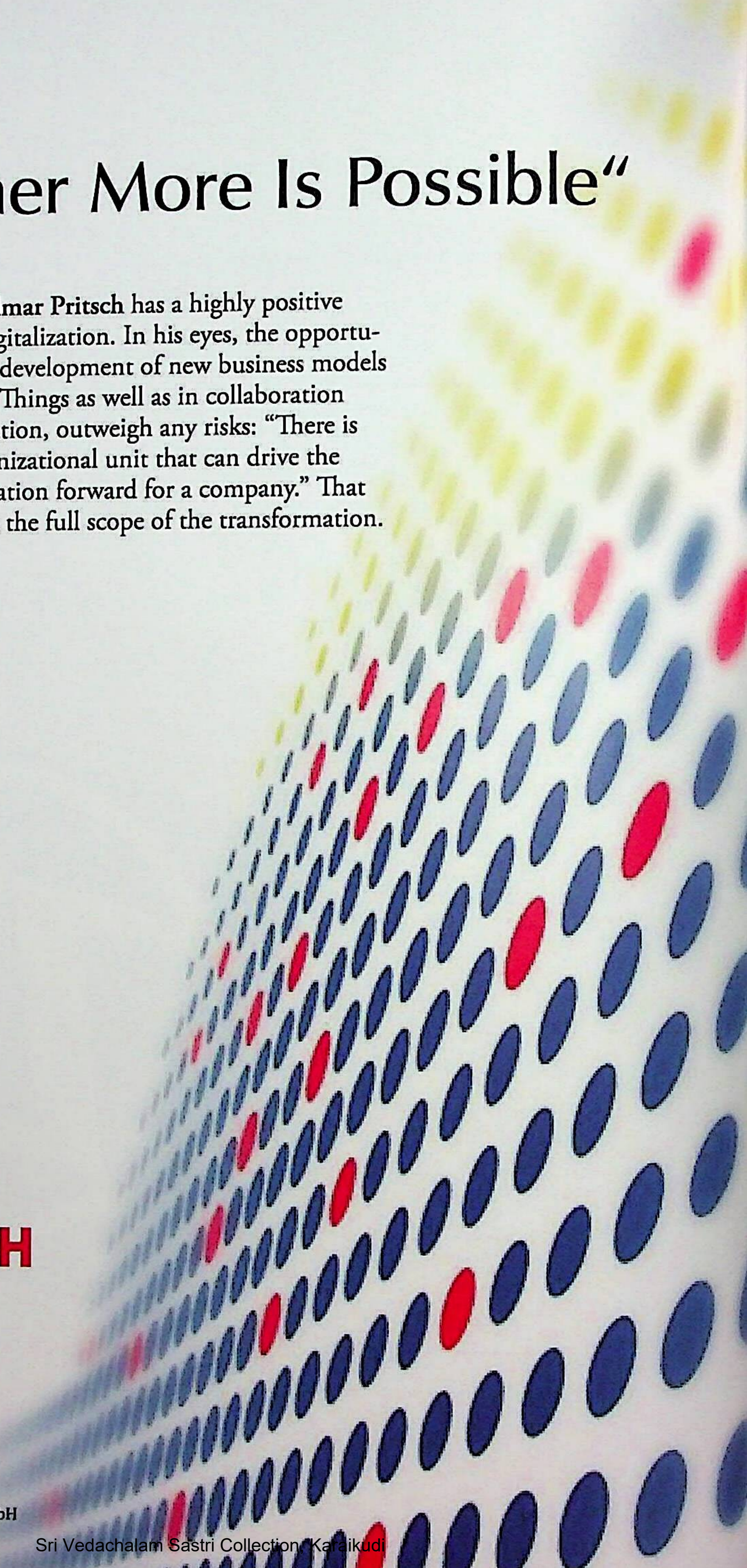
ZF

„Together More Is Possible“

Bosch-CIO Dr. Elmar Pritsch has a highly positive attitude toward digitalization. In his eyes, the opportunities, both in the development of new business models on the Internet of Things as well as in collaboration within the corporation, outweigh any risks: “There is no one single organizational unit that can drive the subject of digitalization forward for a company.” That is why he supports the full scope of the transformation.

Interview

BOSCH



Question: From your perspective as CIO, what success stories does digitalization have in store?

E. Pritsch: Digitalization is nothing new for us because Bosch has a clearly defined strategic goal: We create solutions for connected lives. Three fundamental elements are essential for this; we call them our "3S" in connectivity business. Using sensors, we collect data so that we can obtain a virtual image of the real world. Software is needed to connect things with one another in the Internet of Things. Finally, we develop services and new business models that generate added value for the customers on the basis of the software platforms. Examples of success stories are our solutions from the sectors smart home, industry, energy and facility technology, and connected or autonomous driving.

Question: While speaking about the Internet of Things, you said once that Bosch had the goal of connecting 100% of its electronic products. Almost 50% of the Bosch product classes are already connected. What challenges do you see with regard to the labor market and workforce, key word "human-machine interaction"?

E. Pritsch: Virtually no other company is as well prepared for the subject of Industry 4.0 as Bosch. We see enormous opportunities and possibilities in this area. New, networked production solutions are more efficient and can respond significantly more flexibly to changes in demand in the added-value chain on short notice. The question whether this would eliminate jobs was raised as far back as my school days. Today, however, technology is supporting the work done by people in production better than ever before. Certain activities and professions will certainly disappear as a consequence of technological transformation. New and more demanding activities and professions will appear in their place and become stronger. The challenge for companies will be recognizing this and providing a framework for the transformation. Flexibility and closer collaboration must be encouraged. I see a chance for Germany to exploit this great potential and build a lead in innovation with these new technologies, thereby strengthening further Germany's competitiveness as an industrial location.

Question: We had an interview with Thomas Sattelberger on the subject of creativity. His statement was that we Germans can be efficient, but not innovative. Would that be a theory you would go along with in the field of digital business models, an area in which the Americans in particular are felt to be far ahead? If so, how would the general conditions in Germany have to be changed so that we could take off here?

E. Pritsch: I don't see that the one excludes the other. Bosch and other companies have succeeded in driving innovation as well as efficiency forward. The combination of both is a strength that Bosch has repeatedly displayed in the 130 years of its company history. We are developing new markets that are full of promise such as the smart home and connected industry and simultaneously seizing all of the opportunities that open up on traditional markets. As far as future success in the connected world is concerned, I believe there is a lot of catching up to do when it comes to wide-area coverage of broadband networks. We also need the regulation of data protection at a European level so that we have a uniform digital market in Europe. We are undoubtedly behind in this respect in comparison with the USA.

Question: Can Bosch also give impetus to the subject of education?

E. Pritsch: The spread of connectivity is a gigantic opportunity for Bosch. An indispensable prerequisite for its exploitation is software and IT expertise. I would like to see us put the subjects of IT and connectivity at a very early point on the curricula of universities and schools. Bosch is planning to hire about 14,000 academicians worldwide in 2016. Almost half of the vacant positions have some relationship to IT or software. Moreover, we are cooperating very closely with institutes and universities; with one of them, the Fraunhofer Institute, we have evolved our own workplace of the future. We are very interested in reinforcing these initiatives in Germany.

Question: You recently created a division for the subject of security. Could we not say that Germany is at an advantage when the issues are data protection and data security?

E. Pritsch: Yes. The awareness among our customers for the protection of their information and our efforts to do everything for this goal are clear advantages. Connectivity will be successful only if there is trust: trust in the function and trust in the protection of the data. We will tell our customers exactly what data from them we will use for what purpose, and we will obtain our customers' consent for this use. Our solutions meet the highest security standards for system security. In 2012, Bosch strengthened its position with the security specialists escrypt, a leading system provider for embedded security.

Question: In a study on Work 4.0 that we conducted jointly with Deutsche Telekom and the University of St. Gallen, we made the proposition "SAP instead of McKinsey". The idea behind this was that IT systems such as ERP software are so dominant in their influence over structures and processes that the concept of "organization, processes follow strategy" had been replaced by "organization, processes follow ICT". Do you see this the same way?

E. Pritsch: One great advantage enjoyed by Bosch is that we have an extremely high level of SAP expertise. Our database contains valuable information about our products, logistics, and material flow. One important buzzword is big data. I will nevertheless answer the question from the other side: just as before, the business prescribes the fundamental logic for the IT. Either the IT makes a contribution to efficiency, or it actually creates new values as part of the product. I am oriented strongly to the business side and ask myself what we can do to contribute even more to an increase in efficiency.

Question: How do you perceive your role as CIO? And how will this possibly change when we reach a higher level of digitalization?

E. Pritsch: Digital transformation is changing companies. As the degree of connectivity increases, we at Bosch will align the entire corporation even more closely than before with speed, innovation, and scalable solutions and services. The role of the CIO will develop more and more into that of an active partner for business. That means recognizing new potential at an early stage and translating it accordingly into IT solutions. Another element will be the necessity to create new solutions that can be used in various business units to promote networking and collaboration. We can provide excellent support for this from the IT perspective. Experience also shows that together we achieve more. There is no one single organizational unit that can drive the subject of digitalization forward for a corporation.

Question: What do big data mean for you, both in the direction of products and internally? Where do you see opportunities and risks that you should be concerned with?

E. Pritsch: Data analysis should be deeply rooted in the DNA of our company. Ever greater amounts of data are the basis for better and better analysis. The first step is to distill data from things and processes, and in the second step to derive services from data. We can generate clear added value here with our IT by making databases available for the corresponding platforms and algorithms. There are many exciting projects related to big data being conducted in our research and technology centers – in Palo Alto in California or in Bangalore in India, for example.

Question: Are you also working on the collection of data from employee conduct?

E. Pritsch: No, that is not appropriate to the culture of trust at Bosch. We carry out an employee survey throughout the entire company every two years. We are very open with this and ask our employees for feedback and suggestions for possible improvements in all directions.

Question: You mentioned the work with software. These processes often go on for very long periods of time, which is not a good fit with an agile environment. How have you succeeded in making the software development process faster and more agile?

E. Pritsch: Slow does not always mean bad. When we think in the direction of platforms, solutions must be stable, scalable, and highly available. Agility does not do us any good here because it leads to instability. When it then moves close to the products, close to the markets, speed and innovations are essential. Trends must be recognized and implemented early. This takes me back to the question of togetherness. Success is only achieved if the innovative potential of the market is joined to a scalable platform.

A sterling example of this at Bosch is the Internet of Things. We give engineers, startups, and incubators the opportunity to use connectible products to build solutions that then communicate with a platform. By adhering closely to the principle of "trial and error", an app or service can be corrected with relatively little effort. We don't want that for a platform because in this case the investments must be secured for the middle or even long term. The combination of the two brings the success on the market. The trick is to maintain the right balance. The relationship is similar to that of an app and an app store. You want to see the results from an app relatively quickly. You do not want to update the app store every day.

Question: Are you also working on the subject of robotics? For example, are you examining the question of how you must adapt skills in the company with the aim of finding new areas of work for employees whose tasks are being automated more and more by machines?

E. Pritsch: I see great opportunities, especially in fields related to Industry 4.0. For example, Bosch has developed a production assistant, the APAS, which is the first robot approved to work directly with humans – without a protective zone around it. This has been made possible by a highly sensitive sensor skin. Moreover, incoming goods can be processed significantly faster with the aid of sensors and RFID technology. Employees can respond faster if a consignment arrives late, for instance. Bosch is both a leading provider and a leading user in the field of connected production.

Question: A final question: What do you believe will be the greatest challenge in the next five to ten years?

E. Pritsch: I believe there are two major things. One is that we must realize an IoT ecosystem within Bosch Group and that we must make this connectivity possible across all of the business unit boundaries. The other is that we must create an organization that will make this possible. It is not just a matter of technology – it involves collaboration, the fostering of room to maneuver, and the right competencies.

Dr. Elmar Pritsch came to Robert Bosch GmbH in October 2013. He is CIO and Chief Executive Officer of the central area "Corporate Sector Information Systems and Services" (CI). He is also Member of the Supervisory Board of BSH Hausgeräte GmbH, Member of the Board of Cyber Securing Sharing and Analytics e.V. (CSAA) as well as Curator of the Informatik-Forum Stuttgart e.V. Before he was a founding member and COO of CBS for Financial Industries GmbH and had leading positions at GAD eG, Booz & Company GmbH, Planet Media GmbH and Ericsson Eurolab GmbH.

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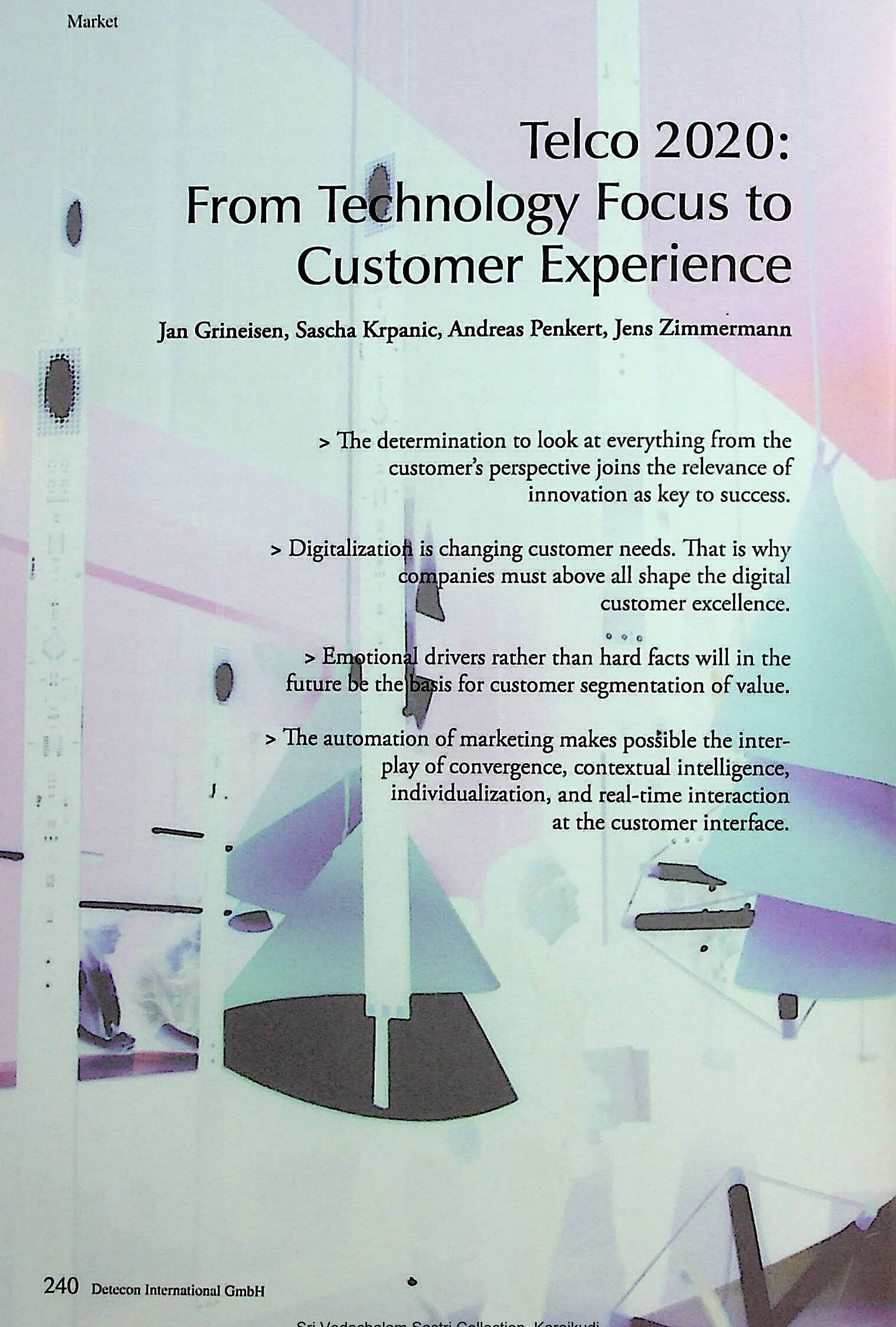

Telco 2020: From Technology Focus to Customer Experience

Jan Grineisen, Sascha Krpanic, Andreas Penkert, Jens Zimmermann

- The determination to look at everything from the customer's perspective joins the relevance of innovation as key to success.

- Digitalization is changing customer needs. That is why companies must above all shape the digital customer excellence.

- Emotional drivers rather than hard facts will in the future be the basis for customer segmentation of value.

- The automation of marketing makes possible the interplay of convergence, contextual intelligence, individualization, and real-time interaction at the customer interface.

Innovation has always maintained an unshakable position on carriers' agenda. The objectives of initiatives related to innovation are also congruent with one another as a rule: the development of unique and outstanding products or services, ideally a comparative advantage over the competition, that is supposed to be followed by commercial success.

But is this focus still sharp enough today? Cost pressure from falling prices, stagnating sales because of the substitution of important cash cows in core business, the growing competition from OTT providers with an eye on future business models, and the diminishing loyalty of customers are the factors confronting carriers with many and varied challenges.

Nothing new, but more relevant than ever: the customer perspective

Innovative, proprietary products and services are today no longer sufficient to achieve differentiation on the market. Even aggressive price strategies have reached the end of their effectiveness in creating leverage against the backdrop of rising cost pressure. Nothing less than the strict orientation of all added-value activities and processes to outstanding, distinctive customer experience will suffice. The authentic satisfaction of rational and (above all) emotional expectations and needs of customers, at all times and at every touch point of the company, is today and will be in the future a decisive driver in a competitive environment that is to all intents and purposes saturated.

The situation of transparent, highly competitive markets has produced customers who confidently flex their muscles when dealing with companies. Consumers are profiting from the ongoing advance of digitalization and the related achievements such as self-services and social networks. Carriers must focus their strategic goals on excellent, differentiating customer experiences. The customer viewpoint is becoming the "guiding principle" of the organization and its business model. This does not mean that the development of technologies and of innovative products and services will play a subservient role in the future. On the contrary, it postulates the necessity of a balance between such developments and the needs of the various customer segments. Thinking and acting from the perspective of customers implies understanding and interpreting their different needs and expectations. The primary question for companies is consequently this: What form will the future ideas, demands, and expectations of our customers take?

Customer experience strategies must be planned ahead specifically for the company and the industry and systematically put into place. Approaches such as thinking in categories of "persona"[1] take their place alongside consideration of socio-demographic aspects such as age, income, value system, status in life, and motivators. Digital affinity and user behavior are additional new dimensions that further refine the clustering of customers and their way of life.

Digitalization is changing customer needs

Customer expectations are strongly shaped by digital developments. The digital touch points of consumers have direct impact on the relationship between companies and customers. The task of working "hand in hand with customers" to mold jointly the future of the company and the brand takes its place alongside traditional marketing measures and campaign models.[2] Digitalization is accompanied by the following fundamental changes:[3]

SOCIETY: As originally understood, service is a secondary performance related to a product or a stand-alone service. Service encompasses a much broader range today: an integrated, constant companion for an individual, a kind of personal assistant, who has the job of simplifying daily life. As a consequence, the intensity and speed of the interaction between consumers and companies are growing.

COMPANIES: Customers are becoming the central focal point of business actions. Corporate organizations are realigning themselves – away from the traditional added-value model and in the direction of the digital service network. The interconnection of companies, customers, and products is taking the place of the usual way of thinking in terms of processes. All of the corporate functions collaborate with one another with the goal of creating an excellent customer experience.[4]

COMMUNICATION: The number of interaction channels is growing. This growth is accompanied by an increase in complexity and rising demands on communication skills. Consumers act flexibly and across all channels in various contexts. The number of personal contacts between companies and customers is on the decline, but when they do occur, they are more intense because they will in the future focus on solutions to serious problems or special cases. Standard communication is occurring more and more often in a digital human-machine dialog that enables customers to take care of their issues completely and autonomously.

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[1] *Cf. Personas are fictitious persons whose features characterize users or customers and make it possible to place them in target groups used in marketing or IT development.*

[2] *Cf. Schnoor: „Alles auf Anfang. Das Marketing der Zukunft gehört dem Kunden.", in: aquisa Marketingtrends 2016.*

[3] *Cf. Wertschätzungsmonitor 2014.*

[4] *Cf. Penkert: "He Who Serves, Wins" in: Detecon Management Report 2015, pp. 46-49.*

INFORMATION TECHNOLOGY: The constant availability and processing of information regardless of location are important achievements of digitalization, yet simultaneously a key demand from the customer perspective. Building on the crossover availability of personalized data, the dialog is becoming more specific, more up to date, and more predictive.

How will carriers be able to hold their own in the highly dynamic competition of the future when customers' expectations and ability to influence events increase at the same time? The key is in the long-term design of the customer interface and relationship, especially when growth in numbers, as is the case on the telecommunications market, is finite. The pivotal challenge of the future will therefore be the molding of digital customer excellence. Customer excellence means the authentic fulfillment of rational as well as emotional key expectations of customers. The fundamental identification of the core needs that are changing along with digitalization and of increasingly specific expectations is helpful for improved understanding of customer behavior.[5]

Trends in the design of the digital customer interface

Customers' life styles and their habitual use patterns are highly varied. Nevertheless, there are general trends that, although their effects differ as surroundings and contexts change, possess a broad validity. The success or failure of customer experience strategies depends essentially on whether and how these trends are exploited in the design of the customer interface.[6]

TIME: Over the course of recent years, leisure time as a whole has increased, yet at the same time most people have experienced a significant rise in time pressure. One of a number of causes behind this is the rise in professional stand-by times leading to an overlap between the worlds of work and life ("work-life blending"). The boundaries of fixed time patterns such as the traditional "quitting time", rigid store hours, work and support times are becoming blurred. In this situation, people attempt to optimize the leisure time that is in such short supply in everyday life. Time is a valuable asset.

ORIENTATION: Globalization, the sharing of information, and technical development are advancing at a high rate of speed. The paths to the information being sought become more versatile and shorter, but simultaneously more complex. Customers must sift through an overwhelming range of diversified offers to make sound and correct decisions. The consequence is the need for navigation, orientation, and simplicity, all set as well against the backdrop of time optimization.

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[5] *Cf. Zimmermann/Grineisen: Digital Customer Excellence – Imperative for Customer Satisfaction and Customer Loyalty, in: Detecon Management Report, Special Issue 2016,, pp. 42-45.*

[6] *Cf. Echtzeitkommunikation an der Kundenschnittstelle. Eine Zukunftsstudie von Siemens und Z_punkt, 2014.*

AUTONOMY: As demographic transformation proceeds, customers are not only becoming older, but mentally more mature and knowledgeable. Skepticism about marketing promises is on the rise and leads to greater reservations in consumption. Overall, consumers have become more critical in their behavior and more autonomous in their actions. The desire for simplification and relief is growing. The Internet has become an indispensable aid for making decisions – it enables fast comparison of offers. The issue of the added value of additional services and of their enhancement of quality of life is being given higher priority.

SOVEREIGNTY: The density of information and the number of advertising messages are rising constantly and competing for customers' attention. Conversely, their own concerns often do not find the desired response from providers. Dissatisfaction is largely expressed to third parties rather than being directed to providers. Communication needs the right point in time, the appropriate situation, and an individual address if an offer is to actually reach the intended addressee.

SECURITY: Using the Internet and digital media has become second nature to customers. Rising levels of use and experience are accompanied by greater distrust, and willingness to reveal anything about themselves declines. Yet providers are dependent on generating as much information as possible about customers. Trust is becoming a major currency in the provider-customer relationship. The sensitive handling of personal data with a sense of responsibility is turning into a key skill.

SOCIAL NETWORKS: Own responsibility and self-management are on the rise in people's professional and personal lives. The supportive utilization of synergy effects from virtual communities committed to a common purpose is growing. The sharing economy is one of the growth industries of digitalization: barter and trade in merchandise, recommendations of products and services to others, joint assertion of common cost benefits, sharing and solution of service interests with peer group communities. The growing engagement of customers is becoming a core element of communication.

SERVICE: The social megatrend of individualization continues. Customers want above all to be perceived as unique individuals, no longer as faceless revenue sources in an abstract added-value chain. In such a context, individual appreciation and personal address are important features of a successful customer relationship, especially in the digital age. This calls for innovative solutions in the channel mix.

EMOTIONALITY: Products are becoming more easily comparable with one another and are no longer assessed solely on the basis of value for money. Consumers judge more on the basis of their own experience of how a product or service has performed. The yardstick here is the enhancement of a person's own capabilities, the potential for creating a unique image, and improvement in quality of life. Products and services are supposed to give meaning, not just provide a material benefit. The act of purchasing is an expression of a personal life style. Customers judge companies according to their emotional competence.

The trends described here make it clear that demands on companies from the customer side are becoming more specific and that established segmentation models can no longer fulfill the intended function. Companies must in this sense strike out on new paths for segmentation and marketing.

Emotional drivers rather than hard facts the basis for customer segmentation of sustained value

The classic approach for companies is to view their customers in target groups classified according to dimensions such as age, income, occupation, or marital status. The digital revolution is giving rise to clusters such as digital natives, best agers, or silver surfers. Companies have always used these classifications as the guide rails for their own products and services.

From the customers' perspective, providers who satisfy their customers' needs with the greatest possible individual tailoring or who even exceed their customers' expectations are especially successful and appealing. Customers are prepared to buy repeatedly from the same provider – as long as no competitor comes along with a better offer. If, however, the decisive differentiation factors are lacking, customers' inclination to develop loyalty to a certain brand withers away because products, services, and prices among the various competitors are virtually interchangeable.

Seeking to create more sustainable differentiation from competitors, companies attempt to describe the next stage of customer loyalty in the sense that the brand in itself seeks to generate an expected added value for customers. Along with the fulfillment of the actual needs that customers experience when using the product or service, the brand is supposed to heighten the perceived benefits additionally. If this is successful, customers develop a de facto "brand loyalty". At the same time, the appraisal moves away from value for money and toward perceived added value and benefit. Thanks to the opportunities provided even today by digitalization, customers are able, better than ever before, to compare products, to evaluate brands for authenticity, and to find alternatives. From the company perspective, even differentiation through a strong brand loses its intended impact.

How can companies now utilize intelligent segmentation to bind customers more tightly to their own brand and to reduce price sensitivity? Customers with the final status "needs met" or "loyal to brand" are not yet the ultimate goal for companies. The focus must be directed more to personal, emotional motivators because they decisively determine the decisions and satisfaction of customers. Customers must be developed, step by step, from "no loyalty" to "needs met" to "loyal to brand" to "emotionally loyal".[7]

So we see that customer clusters must also be segmented according to emotional motivators. In contrast to classic segmentation, emotional motivators must be analyzed in substantially more precise detail. Motivators differ with respect to brand, product category, classic customer segment, and even in their status benefits in the customer journey life cycle. Emotional motivators are perceived or expected added value for customers offered by products and services. They relate to individual wishes and longings that inspire and excite customers. There are innumerable emotional motivators that affect customers in their buying decisions. They are subject to constant change within the framework of social transformation. These are just some of the well-known primary motivators:[8]

> *Differentiation from the masses* – Creation of a unique social identity with the objective of being regarded by society as something special.

> *Confidence in the future* – Expectation of an optimistic future that draws a mental image that is better than the present.

> *Protection of the environment* – Strengthening of the attitude that natural resources are threatened and that their preservation must be actively supported.

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[7] *Cf. Magids/Zorfas/ Leemon: The New Science of Customer Emotions; in: Harvard Business Review November 2015 Issue.*

[8] *Cf. Goleman: Motivation: What Moves Us?; in: https://www.psychologytoday.com/blog/the-brain-and-emotional-intelligence/201112/motivation-what-moves-us.*

> *Successful in life* – Sense of a deeper meaning in life that goes beyond financial and socio-economical aspects.

If companies are to address these and many more emotional motivators, they must match their customers with the motivators prioritized for them so that the motivators can be fulfilled optimally. A clustering of this type, however, is not a generic exercise and must be carried out individually for each and every company. What is more, methodologically complex approaches such as multivariate testing or customer shadowing must be used because customers are themselves not clearly aware of their motivators, much less able to communicate them.

Companies must align the entire added-value chain with the customer groups that have been determined if they are to fulfill the wishes and longings underlying the motivators. The interplay of product and service, brand, communication, pricing, and point of sale – if its realization is successfully orchestrated – generates the desired emotional effect in customers. Digitalization has a greater role to play here because digital elements are gaining in importance from the customers' perspective and will therefore be a necessary, usually even a dominant component of every offer.

Communication and customer experience in 2020

The direction is clear: new technologies are opening the doors and letting in greater opportunities for marketers to make effective and efficient use of communication instruments. Whether big data, Internet of Things, or customer analytics – there will be substantially more data containing information about potential and current customers available in the coming years. There will also be the new customer needs, emotional motivators, a new set of expectations. As potential on the part of companies is created, the complexity of the exploitation of this potential also rises.

The question that today's marketers must ask themselves when thinking about the future is this: How can we fine-tune communications so that we do not just follow customers into an uncertain future, but lead them into this future while staying a step ahead of the competition?

Strategies and approaches such as customer centricity, content marketing, storytelling, real-time marketing, omnichannel management, influencer management, experience management, and micro-campaign management will become firmly established and more professional in the coming years. Some companies will turn their focus to optimized campaign management across all possible channels. Others will have their strengths in the provision of creative content, exciting their customers by this means. The decisive point will concern how the described drivers are integrated. The determinants for the customer interface of the future can be categorized according to the following requirements:

- > Convergence
- > Real-time interaction
- > Contextual intelligence
- > Individualization[9]

CONVERGENCE: From multichannel management to omnichannel management – this is the bridge that companies are attempting to build today. Customers of the future demand ubiquity of products, services, and entertainment. And they want it around the clock and "on the go". The intensity of the interaction between companies and customers is rising and will in the future no longer concentrate on specific applications. Platforms, apps, online and offline channels as well as end devices such as cellphones, televisions, wearables, and vehicles will mesh more and more tightly, and companies should regard them as an interconnected unit. This unit must be treated as a convergent whole because it will otherwise not be possible to achieve a uniform user experience. Securing a positive assessment of the customer experience in customer contact will be subject to the even tighter integration of voice, video, and image data, e.g., through video chats without a defined physical location, enriched with gamification approaches (rich media). What appears to be complex from the viewpoint of the company will become an "on demand" experience for customers.

CONTEXTUAL INTELLIGENCE: Location-based services that integrate the customers' current location into communications are already today the object of more attention from companies. Customers, however, continue to be skeptical to some degree about these services and display especially reservations related to data protection.[11]

Nevertheless, taking into account the surroundings in which customers find themselves at any given moment will continue to gain in importance in communications until 2020. The prerequisite is that companies succeed in solidifying customers' trust in them and in enriching traditional customer data with context data in a meaningful way. Besides the integration of locations, current weather conditions, or the time of day, digital communications of the future will play an important role in the assessment of emotions on the basis of facial expressions, gestures, and voice parameters. The goal will be to acquire even better understanding of customer needs in this way. Intelligent interfaces such as infrared cameras, sensor networks, or augmented reality solutions will help in this respect. This context-sensitive anticipation of customers' needs creates a proximity to the customer despite physical distance and an even more differentiated address.

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[9] *Cf. Edelmann/Singer: Competing on Customer Journeys, in: Harvard Business Review, 2015.*

[10] *Cf. GFK Customer Engagement via Global Trends, 2015.*

INDIVIDUALIZATION: Consumers want to be treated as individuals. Looking ahead to the communications of the future, this means for companies the provision of more goal-oriented, tailored, need-aligned, and context-sensitive products, services, and solutions. The generation of data based on context and behavior and historical data along with data from customer profiles and the specific use of these data at the moment of the customers' needs will become indispensable. Even more than is the case today, the interaction of data, IT, and marketing will determine whether hyper-individualization is a success or a failure.

REAL-TIME INTERACTION: Customers of the future will be highly sensitive to the factor of time. This will become more and more important for marketing, and not only because customers expect prompt queries about their concerns of the moment; the speed with which products and services are made available represents a quality criterion of enormous weight. Campaigns that are today carried out at specific points in time (based on the calendar) will in the future be oriented more closely to specific events, e.g., after the purchase of a product or when customers who have a special interest in a product have been identified. Events of this nature will become the triggers of business processes designed to satisfy customers' demands in real time.

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11 Cf. Zimmermann/Naskrent: Digital Customer Excellence – Erwartungen und Wünsche auf der digitalen Kundenreise, 2015.

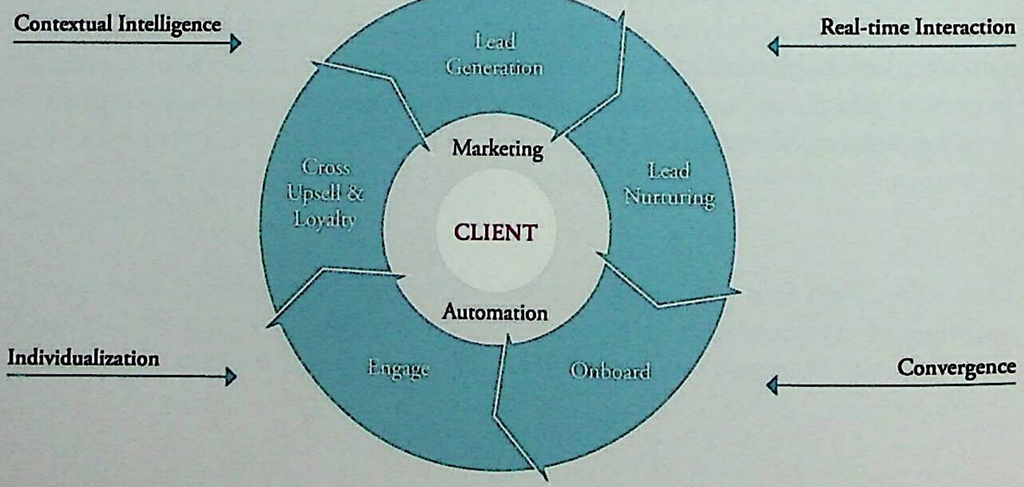
Manifestation in the automation of marketing

The demands made on communications of the future manifest themselves in the automation of marketing that enables the interplay of convergence, contextual intelligence, individualization, and real-time interaction:

> Leads will be generated and forwarded straight to the right sales channel.
> Content will be individually produced in the form of email templates and landing pages.
> Campaigns will no longer be planned and selected; they will instead be automated and trigger-based and will be conducted on the basis of utilization data, order data, and customer behavior.
> Campaigns for the mass market will turn into individualized micro-campaigns in multiple stages.
> The management of individual customer journeys will take the place of channel management.
> Singular touch points such as email will give way to automated touch point chains such as email, website, text message, personalized landing page.

Part of the automation of marketing will be the enrichment of traditional customer profile information such as socio-demographic data, current products, or booking histories with data generated ad hoc (e.g., click streams on websites),

Figure: Automation Along the Customer Journey


Contextual Intelligence
Real-time Interaction
Lead Generation
Marketing
Cross Upsell & Loyalty
Lead Nurturing
CLIENT
Automation
Individualization
Engage
Onboard
Convergence

Source: Detecon

data from social networks, localization data, and information about emotions. These data will serve as trigger points for algorithms and rules serving to select automatically the content that can be translated into campaigns or personalized landing pages and then played via individualized journeys across all channels.[12]

The consideration of customers' needs and surroundings (contextual intelligence), regardless of the channel (convergence), at the right moment (real-time interaction), and personalized and oriented to the customer experience (individualization) places customers at the very center of all actions. The automation of marketing is the enabler along individual customer journeys.

Great prospects for customer communications and the customer experience of the future!

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[12] *Cf. Heimbach/Kostyra/Hinz: Marketing Automation, 2015.*

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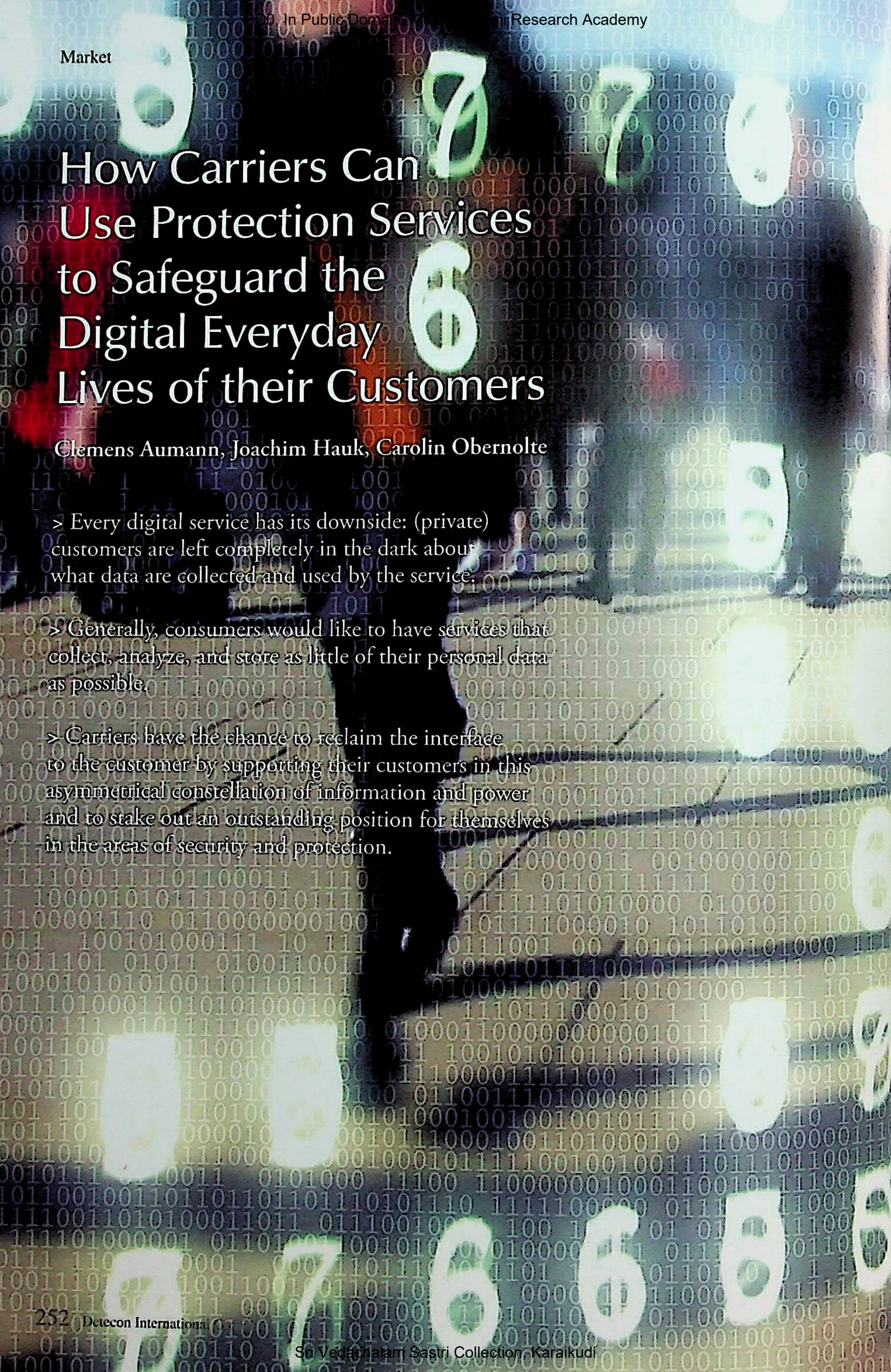

How Carriers Can Use Protection Services to Safeguard the Digital Everyday Lives of their Customers

Clemens Aumann, Joachim Hauk, Carolin Obernolte

> Every digital service has its downside: (private) customers are left completely in the dark about what data are collected and used by the service.

> Generally, consumers would like to have services that collect, analyze, and store as little of their personal data as possible.

> Carriers have the chance to reclaim the interface to the customer by supporting their customers in this asymmetrical constellation of information and power and to stake out an outstanding position for themselves in the areas of security and protection.

The Internet connects all of us. Internet services of almost infinite variety offer many different ways for everyone to use it. Consumers in particular profit from the many and varied services that make their life easier or more interesting.

The daily dilemma: convenience v. disclosure of data

The variety of services ranges from worldwide telephony at no charge using Skype to the exchange of news on Facebook to the sharing of photos with friends on Instagram and communication via video messages on Snapchat. Online shopping services allow purchases to be made flexibly from home, and smart home solutions connect the entire home in a single network so that a smartphone can be used to operate lamps, radiators, and televisions remotely. How convenient all of this is – you don't have to leave your home to do the shopping or stand up to turn devices on and off!

But that is not all. Wearables such as smartwatches allow people to collect and analyze their vital signs; the results can point the way to a healthier life style. Not knowing your way around a city does not mean you have to go to the tourist information office or ask passers-by for directions; just turn on your smartphone's location function and let the navigation app direct you to the desired destination. These use cases are only some of the many examples from everyday life. The benefits of all of the use cases can be summarized under key words such as digitalization, sharing, and convenience. The usefulness of these services, however, is offset by the many and varied risks that also face consumers. Everything has a price – and in this case it is not only a question of money. Consumers pay the highest price by disclosing their data.

Providers of Internet services generate enormous quantities of personal data, then analyze them for the purpose of preparing detailed customer profiles. These profiles are used by providers to tailor advertising and, in general, all types of information to the interests of specific consumers. The problem is that these activities on the part of providers are not transparently revealed to consumers. All the customers can see – based on the advertisements and messages tailored for them specifically – is that inferences are constantly being drawn about their personalities from the generation and analysis of their data. But the collection and analysis of the data are not the only risks for consumers. Many providers of Internet services store their customers' data and may even disclose them to third parties. Consumers have no idea of what may later happen with these data;

they are also at risk because the providers of Internet services cannot fully protect their customers from hacker attacks and espionage as these companies are themselves often victims of massive cyber-attacks.

In short, consumers are no longer the masters of their personal data. They can neither control what data are recorded and analyzed nor determine when and how long their data are stored. If they want to avoid these risks, consumers have to do without Internet services. Conversely, they do not receive any economic compensation for the use of their data or any share in the added value generated for the companies using the data, although a recent study by the Ponemon Institute reveals that consumers are definitely aware of the value of their data.[1]

So what can people do who want to enjoy the benefits of Internet services, but nevertheless want to protect their personal data? Can protection services offer the appropriate protection model to consumers according to their individual need for protection? Would such a protection model be at all helpful and desirable from the customers' perspective?

Key theses about protection of personal data from the customer perspective

1. Lack of transparency for consumers regarding the use of their data: There is a lack of transparency, ranging from extensive to complete, for consumers concerning the recording, processing, analysis, and storage of their data. According to the Eurobarometer study on the subject of data protection, 50% of the respondents replied that they had only partial control over their data. 35% of the respondents stated that they did not have any control whatsoever over the data they share.[2]

2. Risk of complete surveillance and spying: Consumers are increasingly aware of the risks of surveillance and spying when using Internet services. The Eurobarometer study reveals that 50% of the respondents are concerned about becoming victims of the misuse of their data. 32% of the respondents fear that their information is used or even stolen (29%) without their knowledge.[3]

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[1] *Cf. Study of consumers from Europe, the USA, and Japan according to various categories. Example: health measures, $35; buying history, $17.80; employer/training status: $8.50; current geographical location: $5.10. Ponemon Institute, Privacy and Security in a Connected Life: A Study of US, European, and Japanese Consumers, 03/2015, pp. 17.*

[2] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum.*

3. Lack of trust of consumers in the companies processing their data: Consumers must entrust their data to the Internet service providers if they want to utilize the offered services. Yet there is a heightened mistrust on the part of consumers regarding these companies when the issue is the handling of their personal data. The Eurobarometer study showed that 78% of consumers find it hard to trust the companies that process their personal data. Even though almost 80% of the surveyed consumers mistrust the data processing companies, the majority of these consumers continue to use the services of these providers because they do not want to do without the benefits or conveniences they obtain from these services. Facebook's acquisition of WhatsApp at the beginning of 2014 is a good example illustrating this situation. When it was announced that Facebook would be acquiring WhatsApp, there was a wave of revolt because Facebook's data protection provisions are not the friendliest for consumers. There were concerns that WhatsApp would be forced to align itself with Facebook's data protection provisions, and this was seen as a risk to the security of the user data.[4] Many consumers, looking for a more secure chat alternative, decided to go to Threema. Even though Threema actually does offer significantly user-friendlier handling of its customers' data,[5] this service was in the middle term not able to compete with WhatsApp and has not achieved user figures (3.5 million) that are anywhere nearly comparable to those of WhatsApp (per June 2015).[6] WhatsApp is still the leading messaging provider worldwide (per February 2016).[7] This could be explained by the unwillingness of the majority of users to make the effort to look for and use an alternative secure solution.

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[3] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum.*

[4] *Cf. Radke, WhatsApp: Hinweise auf Zusammenführung mit Facebook, 2016: http://www.heise.de/newsticker/meldung/WhatsApp-Hinweise-auf-Zusammenfuehrung-mit-Facebook-3082755.html.*

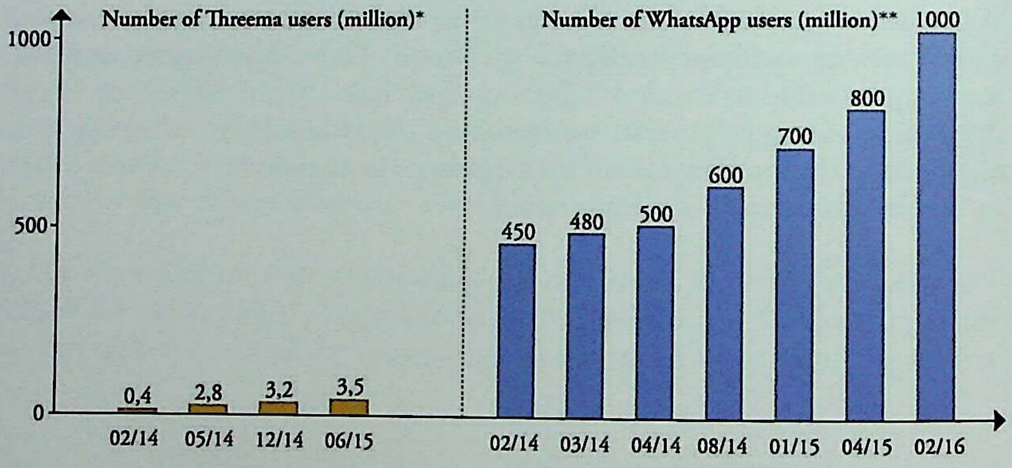
[5] *Cf. Stiftung Warentest (Hrsg.) WhatsApp und Alternativen: Datenschutz im Test, https://www.test.de/WhatsApp-und-Alternativen-Datenschutz-im-Test-4675013-0/.*

[6] *Cf. Statista (Hrsg.) http://de.statista.com/statistik/daten/studie/445619/umfrage/nutzer-des-schweizer-messaging-dienstes-threema/.*

[7] *Cf.. Statista (Hrsg.) http://de.statista.com/statistik/daten/studie/285230/umfrage/aktive-nutzer-von-whatsapp-weltweit/.*

4. Growing unease when using Internet services: There have been a number of incidents in the past in which companies have lost customer data because of security gaps and hacker attacks. In October 2013, for instance, three million credit card records of Adobe customers were stolen.[8] These and other such incidents have not only raised the level of fear among consumers regarding malware and cyber-attacks, but have also increased their awareness of the value of their data. Their fears of becoming potential victims of data misuse incidents or identity theft are on the rise. The information policies of many companies in the event of data misuse or security breaches are often much too defensive and reinforce these reservations.[9] But despite these fears, the majority of consumers do not handle their data carefully. A study conducted by GSMA on the subject of awareness of data protection provisions of mobile Internet users determined that 80% of the users of Internet services or apps accepted the data protection provisions without reading them because they are too long or contain too much legalese.[10] This implies that consumers are often overwhelmed by the current data protection provisions.

Figure 1: Comparison of User Figures for Threema and WhatsApp



* *Statista (Hrsg.), Anzahl der Nutzer des Schweizer Messengers Threema von Februar 2014 bis Juni 2015 (in Mio.). http://de.statista.com/statistik/daten/studie/445619/umfrage/nutzer-des-schweizer-messaging-dienstes-threema/.*

** *Statista (Hrsg.), Anzahl der aktiven Nutzer von WhatsApp weltweit von Februar 2014 bis Februar 2016 http://de.statista.com/statistik/daten/studie/285230/umfrage/aktive-nutzer-von-whatsapp-weltweit/.*

Source: Detecon

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[8] *Cf. Little, Personal Data and the Big Trust Opportunity, 2014, pp. 14.*

[9] *Cf. Rybak, In the Age of Cyber Smash and Grabs: Safeguarding Customer Loyalty, Ring-Fencing Customer Data, Current Analysis, 2015, pp. 3.*

[10] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 19.*

5. Growing demand for protection services: Consumers are not only demanding more and more security during the use of Internet services, but are also insisting more persistently that they want to be able to decide where and to what extent they disclose what data. According to the GSMA study, 60% of the surveyed consumers want a standard body of rules for the protection of their data and want all providers to comply uniformly with these rules.[11] Even though most customer solutions are still not understandable and are too technical for the average user, more and more consumers are concerning themselves with the subject of security because the significance and necessity of security solutions are rising in the eyes of the consumers.[12] Until now, however, consumers have by and large had to become active on their own initiative if they wanted to protect their data because they did not receive any active or extensive help or the appropriate services for this purpose. A study conducted by Orange on the subject of behavior change among consumers in relation to data protection revealed that 37% of the respondents had the feeling that companies or organizations did not give them any instructions for personal data management.[13] Consumers are more likely to have the feeling that they are dependent on the good intentions of the providers despite the previous agreement of data protection provisions. "[Customers] are concerned that companies are using their data for more than was initially agreed."[14]

6. Less trust in OTTs than in telecommunications providers: Consumers regard OTTs as companies that want to profit from the data of their customers. Telecommunications companies, on the other hand, are perceived as the "clearing agents" of data and are therefore seen to be more trustworthy where the handling of personal data are concerned: "[…] [Operators] are often seen as more trustworthy than Internet companies or other service providers and can position themselves more strongly in terms of protecting their customer's privacy."[15] According to the GSMA study, telecommunications providers are even regarded as the consumers' contacts when there are problems related to the subject of protection of data or privacy because 58% of the respondents ask telecommunications providers for help whenever they have these kinds of problems.[16] A recent study by Syniverse, however, shows that the trust consumers have in mobile providers has declined. Respondents were asked to state whether their trust in mobile providers with regard to the protection of their personal data had changed.[17] Half of the respondents indicated that over the last three years they have had "less" trust, 35% have had "just as much" trust, and 15% have had "more" trust in mobile providers.[18] This implies that consumers have become increasingly skeptical about mobile providers when it comes to data security over the last three years. A basic finding, however, is that consumers of providers who give them more control and transparency in the management of their data are regarded more positively than other providers who resist or even refuse to give transparency: "Consumers appear increasingly to trust and to use companies that are willing to offer them greater control through tools that are easy to use."[19]

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[11] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 19.*
[12] *Cf. Mohr-McClune, Zeitgeist Communications: Speaking in Confidence, Current Analysis, 2015, pp. 3.*
[13] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 22.*
[14] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 25.*
[15] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 6.*
[16] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 19.*

This customer perspective clearly shows that consumers always want services that collect, analyze, and store as little of their personal data as possible. Since in reality there are almost no offers of any such services at this time, customers must accept the loss of control over their data. Nevertheless, they are becoming increasingly sensitive to the topics of security and data protection so we can deduce there is a fundamental need for protection services. Since many consumers often have difficulties understanding the content of data protection provisions, such services should aim to provide intuitive security services that are simple to understand and simple to use and that customers can use to manage the security of their data. Protection services are a measure that builds trust among consumers as it gives them transparency about and control over the utilization of their data.[20] Conflicts of interest severely limit the credibility of the providers of services. Since customers use a number of providers at the same time, clarity suffers. In our view, only regulatory authorities, network operators, or completely new companies will be able to provide a relevant protection product that encompasses all of the services and at the same time offers impartial protection. We believe that network operators are in the best position to provide this: the traffic flows all come together in their purview, they have the customer relationships, and are less sluggish than government authorities. In comparison with the startups that are appearing, they (still) have the advantage of greater reach from their clientele, brand awareness, and trust in the brand.

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[17] *Cf. Syniverse (Ed.): The attitude of consumers with respect to data protection was surveyed in this study. More than 8,000 consumers in eight countries were questioned.*

[18] *Cf. Syniverse (Ed.) The Mobile Privacy Predicament, pp. 12, https://www.syniverse.com/assets/files/custom_content/Mobile-Privacy-Predicament-Report.pdf.*

[19] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 25.*

[20] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum, pp. 6.*

Key arguments in favor of offering protection services from the telecommunications providers' perspective

Regional representation and high reachability: Large telecommunications companies cover a broad geographical territory through their own subsidiaries or partners. In the countries where they provide service, they can generally be reached easily because of the full-area coverage provided by a network of shops and their excellent accessibility on digital and phone channels served by large service units operating these channels; they are consequently well prepared to respond and act, especially if there are problems or in crisis situations. In their position as local telecommunications service providers who are subject to domestic jurisdiction, legal action can be taken more directly against carriers despite their multinational character – and this can be emphasized during brand positioning as a dimension that builds trust.

Data and communication security is a part of the core business: The security of the networks and the communications that flow through them have long been a part of the core business of telecommunications providers. They never stop thinking about these aspects and have the corresponding expertise at the technical, procedural, and regulatory levels. They are especially qualified to incorporate the growing regulatory pressure related to data protection and data security operatively and productively.[22] They can control data security in the utilization, processing, and transportation layers of their ecosystem, and this contributes additional credibility to their portfolio. However, this presumes the appropriate sensitization and emphasis on the subject as well as the adaptation of the appropriate plans for actions and emergencies in the event of a security incident.[23]

IT competence and trend to cloud products: Most telecommunications providers already have pronounced IT competence, in some cases including even their own divisions or branch businesses whose core business includes IT development and operation for customers. As cloud products become increasingly important and large telcos acknowledge this by expanding their portfolios accordingly, these business offers will gain additional impetus, but they must also meet heightened security demands.[24]

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[21] *Cf. Clark-Dickson, Data Mobile operators' consumer mobile security strategies, Informa, 2014.*

[22] *Cf. Little, Personal Data and the Big Trust Opportunity, Ovum, 2014.*

[23] *Cf. Rybak, In the Age of Cyber Smash and Grabs: Safeguarding Customer. Loyalty, Ring-Fencing Customer Data, Current Analysis, 2015.*

[24] *Cf. Schiavoni, Data Protection Tracker 4Q15, Ovum.*

Simple processability of security services in the business model: The character of communications services as a continuing obligation is consistent with the business model of protection services as they also represent a commitment that is ongoing or related to a period of time. Protection services of this type can be offered simply as a supplementary option to existing contracts or as a stand-alone product. The matching billing opportunities are available (as well as capacities for third-party providers or partners, generally as part of the previous business model).[25] The necessary distribution and service competencies are already in place as well or can be added with little effort.

Overall, telecommunications service providers have an excellent position, from the customer perspective as well as on the basis of their branding and the required competencies, to assume the role of guardian of customers' data security. The next question concerns the possible form of such a service, i.e., what design elements and levels are desired on the customers' side and would represent sensible components of an attractive service.

Seize the opportunity: build up a protection portfolio step by step (Protection as a Service)

Monetarization can be realized as explicit protection services as well as in the form of a general premium price model based on perceived brand dimensions. In our opinion, a logical approach is a step-by-step build-up that combines both concepts.

The fundamental axis is the impact depth of the protection. Only shallow impact depth will be realized if the information customers receive from their providers:

> Is provided only on rather rare occasions, e.g., when the contract is concluded or if significant risks appear;
> Is related primarily to the services and data offered or used by the provider itself;
> Is mostly very generalized;
> Concerns more general risks.

Starting from such a basic foundation, a protection portfolio can be developed gradually along three:

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[25] *Cf. Clark-Dickson, Data Mobile operators' consumer mobile security strategies, Informa, 2014.*

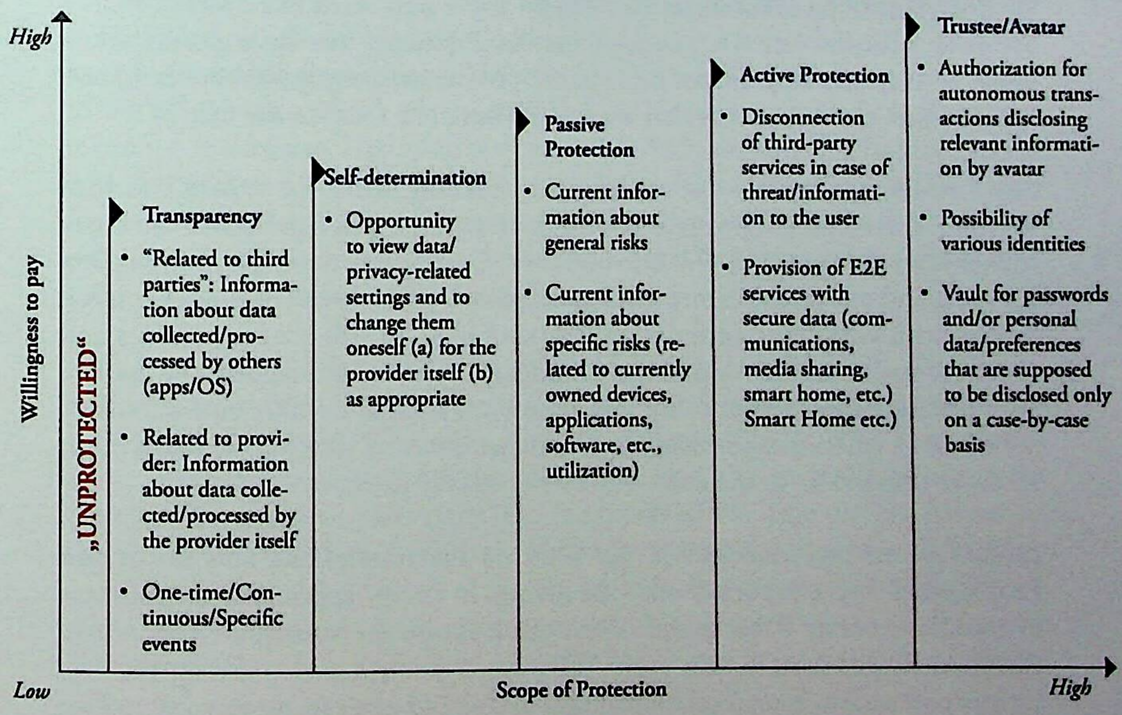
1. Timeliness, nature, and scope of the risk assessments, i.e., the question whether these are only services that the carrier itself offers or services that go (slightly/extensively) beyond this scope;

2. Degree of personalization of the security information, i.e., assessment or information only if the installed and utilized services are affected;

3. Action intensity, i.e., information only or a concrete request to take action.

We assume here that greater depth of the protection service will go hand in hand with increased willingness to pay. The portfolio evolution depicted in the figure below begins with the creation of transparency as a "measure to build trust" and develops step by step into an avatar that can assume a broad range of virtual identities for customers in their relationships to other virtual transaction partners.[26] We see only the positioning and the brand goodwill with parallel premium pricing as a monetarization approach for the portfolio cluster "Transparency and

Figure 2: Potential Protection Services for Carriers


High
Willingness to pay
Low
„UNPROTECTED"
Transparency
• "Related to third parties": Information about data collected/processed by others (apps/OS)
• Related to provider: Information about data collected/processed by the provider itself
• One-time/Continuous/Specific events
Self-determination
• Opportunity to view data/privacy-related settings and to change them oneself (a) for the provider itself (b) as appropriate
Passive Protection
• Current information about general risks
• Current information about specific risks (related to currently owned devices, applications, software, etc., utilization)
Active Protection
• Disconnection of third-party services in case of threat/information to the user
• Provision of E2E services with secure data (communications, media sharing, smart home, etc.) Smart Home etc.)
Trustee/Avatar
• Authorization for autonomous transactions disclosing relevant information by avatar
• Possibility of various identities
• Vault for passwords and/or personal data/preferences that are supposed to be disclosed only on a case-by-case basis
Scope of Protection
High

Source: Detecon

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[26] *Cf. Deuker, Aumann, Albers, Duschinski, „Bekommen statt Suchen – Warum wir unsere Interaktion zukünftig an Smart Agents übergeben", in: Detecon Management Report, 3/2011, pp. 8-17.*

Self-determination". In our opinion, the opportunity to offer this approach as an independently priced service appears with the cluster "Passive Protection".

Carriers have not taken general possession of this protection function. But there are already OTT providers who are actively positioning themselves in the direction of protection function and data security. One example is Digi.mem, an app that has developed from the function of a private storage facility for personal social media content into a security function. This app is already being used by 350,000 customers in various countries. The company has plans to extend the scope of the function in the direction of content sharing in the form of profiles released by customers later in 2016. There is also the competitor Datacoup, which sells profile information released by customers to interested data buyers and compensates the customers with payouts. Datacoup is at the moment active only in the USA, however. These are indications that pioneers are already staking out positions in this gap. Telcos must act quickly and seize the "window of opportunity" before it closes.

Demand today and tomorrow: a quick check

At first glance, the avatar described briefly above may seem like a vision from a far-distant future. But if we look at the developments that have already taken place or the ones now in the pilot phase (and consequently within reach), we quickly have the impression that we already have one foot "in the matrix":

Am I watching television – or is television watching me? 2 Two smart TVs with webcam, three laptops, two tablets, and three smartphones combine for no fewer than fifteen cameras and ten microphones. One watch monitoring my sports activities and one action camera plus smartphones and tablets translate into seven devices with GPS/location function. The shopping list still contains sensors and cameras for the security of the smart home. Data protection regulations for 107 apps from the most recent count that have been read: 2; number understood: 0. Who knows when these devices transmit what data and who has, or could have, access to the devices or the data? The owner usually does not.

Stalked in the supermarket?! Is the WiFi on the smartphone now on or off? People often forget to turn it off – the savings in energy appear too insignificant to take the trouble. What people don't think about: the smartphone cheerfully shares its ID (its MAC) with every WiFi access point it passes during the day. Companies such as Euclid take advantage of this and generate movement profiles based on the device ID for retail companies prepared to pay for the information. How long a user is in what supermarket, how long he or she stood in front of what shelf, and the points the user rushed passed become visible. Users should receive bonus points entitling them to discounts for the provision of these data. As a minimum.

Paying with a beautiful voice instead of your "good name"? Voice is becoming increasingly popular as a convenient means of control. The "hands-free" payment by voice command currently tested by Google appears to be the next logical and convenient evolutionary step after the control of iPhone, Xbox, Amazon Fire, and Google Now. No one disputes that a voice pattern has certain advantages over a PIN. But it does not work unless the devices are constantly listening to you. Is it possible to determine whether the camera and microphone are really turned off – and stay off? Are the service providers always eavesdropping?

What does the future look like? Growing connectivity of personal devices of all kinds, an increase in the connected devices for improved company processes – all of this will lead to exponential rise in the density of the sensors surrounding us. Moreover, the number of network access points for precisely these sensors will increase significantly. The probability of our communicating with others, whether we are aware of it or not, in all areas of our lives will mushroom significantly. The situation becomes disquieting when we give serious thought to what the linking of all these data can do. The television knows what we are watching, the heartbeat monitor records our reactions to what we see – outstanding for the measurement of the effectiveness of the advertising! The car insurance company believes that it can use the data to determine the extent to which we obey the laws of physics and the highway code – and adjusts the premiums accordingly. The health insurance company believes it knows whether, when, and how much we exercise or go shopping in our local wine shop. Will we still be able to get insurance if we refuse to allow ourselves to be tracked?

At the moment, the risks do not appear to frighten users very much. Despite the criticism heard from many different sides, the user numbers for large platforms such as Facebook and WhatsApp have not suffered significantly. The network effect – the decisive point for the individual: that the majority of his or her contacts also change – plays right into the hands of the large players. Moreover, the risk is still considered relatively low from the user perspective. WhatsApp users, for instance, see the risk of unsecured messages as generally negligible. As digitalization continues to advance, however, this perspective will become more disproportionate: fully digitalized everyday life cannot be anything but fully documented and analyzable everyday life.

We see the greatest risk in the curtailing of information neutrality. What happens if the seamless record of a person's behavior is used as the basis for providing only that information that others (systems) deem to be relevant? Instead of being able to see the full range of world events and shopping opportunities that is available, a person will be given only an enhanced mirror image of what are seemingly his or her interests and inclinations. The "classic" risks such as identity theft, transaction fraud, or extortion are, and will remain, more tangible and encountered in daily life. All of these risks will be multiplied by the progressively deeper penetration into personal everyday life by digital services in the future.

Carriers should stake out a position – and soon

In summary, we have prepared five hypotheses that serve as guideposts for carriers for the step-by-step determination of their need for action:

1. Drivers on the demand side: The insecurities experienced by users of telecommunications services as digitalization progresses will escalate rapidly.

2. Opportunity for carriers: In the current market system, carriers are fundamentally the most qualified entities to create services that respond quickly across all sectors and to provide transparency and protection to a broad range of customers.

3. Time pressure for carriers: The longer carriers hesitate to stake out a position "in opposition to" OTTs, the more they will be viewed as the latter's supporters.

4. Assessment and development requirements for carriers: The monetarization of the possible aspects related to customer data is viewed at this time almost exclusively through the "classic" big data glasses. Our experience indicates that the aspect of protection in terms of its possible added value has not been appraised.

5. Need for carriers to act: Not every carrier is today regarded by its customers as being adequately qualified to serve as a trustworthy protective body.

It is therefore urgently necessary for carriers to determine now the positioning that is initially relevant and possible for them. The gradual emancipation from the OTT Big Brother model that is also credible in terms of branding and the empowerment of telecommunications users are possible. The process can be oriented to the evolutionary model for protection services described above. Startups are already addressing relevant elements of this model. In view of the required build-up of competencies and the product development phase that is to be expected, the time to act is now. The need for protection of the digitally illuminated customers is a great opportunity to compensate the losses at the customer interface to the OTTs. In our opinion, it is possible to compensate these losses completely – and even more.

■

„Can I Trust My Data?“ Data Integrity: A Trust Factor for Telecommunications Companies

Daniel Godde

> “Can I trust my data?” This is becoming a core issue for telecommunications companies during digital transformation.

> Data integrity, just like data protection, is an elementary prerequisite for the continued development into a networked society.

> In view of its significance, telecommunications companies should establish data integrity as an integral feature of their brands and not regard it solely as a cost factor.

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Data are among the most valuable assets in a networked economy. Companies must be able to rely on the information security of their ITC infrastructure, their systems, and their algorithms at all times to ensure successfully the added value and ongoing development of their products and services.

In this sense, telecommunications companies bear a special responsibility. They are simultaneously responsible for the operation of the telecommunications networks that are so incredibly important as well as for assurance of the confidentiality and security of the data entrusted to them. As they are operators of a critical infrastructure, they are required by the provisions of the recently enacted "IT Security Act" to guarantee the security of their IT by implementing state-of-the-art technology and to report any cyber-attacks.

The threats that arise when data are compromised are significant. The possibility of confidential information falling into the wrong hands is almost the least of anyone's worries – the functionality of automated processes within the telecommunications networks and subsequently within the processes of the telecommunications customers as well is threatened, insurance premiums rise, litigation looms.

Cyber-crime has become a major business for organized crime. Nor do the attackers hesitate to jeopardize human lives, as was recently demonstrated by the cyber-attacks against hospitals in North Rhine-Westphalia; the failure of the IT systems made it necessary to cancel part of the scheduled operations and to transfer them to other hospitals.[1]

Relevance of data integrity in comparison with data protection

Data protection and data integrity are important pillars for the successful continued development of our society. Data integrity concerns the issue of the intactness of data and the correct functioning of systems. But what is the relationship of these two criteria to each other?

When a telecommunications company is involved, a breach of data protection means that user data become publicly visible; this can undoubtedly result in substantial damage or loss, including the harm to a company's image. If there is a breach in data integrity, however, the operation of the entire telecommunications infrastructure, and with it the national economy dependent on the infrastructure, is jeopardized.

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[1] *http://www.welt.de/vermischtes/article152191361/Cyber-Attacke-schleudert-Klinik-in-90er-Jahre-zurueck.html.*

A breach in data protection for a private use case would mean that personal data (such as a user's braking behavior) would become public knowledge. A breach in data integrity, on the other hand, would result in the corruption of the braking systems of all vehicles, and users could lose their trust in their beloved everyday objects.

How can telecommunications companies protect themselves and their customers from these very real threats? In the past, all security precautions concentrated on controlling access and preventing breaches through the use of encryption, access checks, and firewalls. These perimeter-centric measures will be no less important in the future, but they entail growing problems such as steadily rising costs and the growing complexity of authentication. The consequence is a limitation of access to the data, to the basic resource of the future in a digitalized economy. Moreover, they do not cover the risk of misuse, whether intentional or accidental, by insiders. This threat is constantly growing, as demonstrated by the above-mentioned example of the cyber-attacks on hospitals; an employee had unintentionally introduced a virus into the corporate network.

In such a setting, data integrity in combination with data protection and data backups is the foundation for reliable information processing. Securing data integrity includes measures for discovery and analysis of prohibited changes in the protected data and the means of guaranteeing their restoration to the original condition. The DsiN Cloud Scout Report 2015 detailed in no uncertain terms the significance of data integrity within the context of cloud computing. More than 50% of the surveyed companies mentioned the security of data integrity as a great challenge. It will be important to take this aspect into consideration during the development of improved industrial solutions for heightening security.

Benefit aspects of data integrity

One of the greatest challenges facing companies is discovering the occurrence of an attack without delay so that the appropriate measures can be initiated promptly. According to analyses[2] for 2015, the average time required to discover that an attack had occurred was 146 days. The corresponding figure of the previous year was 205 days, so there has been a constant improvement from the original value of 416 days determined in 2012. Nevertheless, this long period is still more than just critical. One only has to imagine how much damage can be inflicted without discovery during this period and how much money could be saved by its reduction to only a few minutes.

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[2] *Cf. Cloud Scout Report 2015, Deutschland sicher im Netz (DsiN), https://www.sicher-im-netz.de/downloads/dsin-cloud-scout-report-2015.*

[3] *Cf. Mandiant Consulting, M-Trends 2016, https://www2.fireeye.com/rs/848-DID-242/images/Mtrends2016.pdf.*

The people who are responsible for making decisions related to this subject should ask themselves the following questions:

> Can the company determine with adequate assurance whether there is any threat to the data?
> How, and with what expenditures of time, effort, and money, can verification be obtained (in the event of an attack) as to what has happened, when it happened, and who the attacker was?
> Will the company's data satisfy any legal requirements, and can the data be verified?
> What expenditures of time, effort, and money will be required to restore the data to their original condition in the event an attack has taken place?

The areas in which data integrity is of decisive importance are many and varied and range from the protection of critical infrastructure to the verification of software updates "over the air", e.g., when software in vehicles is updated over the mobile network. The FBI recently released an official statement warning car users of "over the air" attacks and advised them to be especially attentive when using "after-market" devices.[4]

Data integrity is an important fundamental requirement for a telecommunications company in two respects. For one, the protection of its own infrastructure is in its very own interest so that it can maintain its business operations. In this sense, the question of security is essentially viewed as a cost factor for the avoidance of risks. For another, however, it can be used for differentiation of the product line, leading to an increase in revenues and brand value. For these reasons alone, security and data integrity should be important components of the corporate and product strategy.

Telecommunications companies recognized that "security" was an important product component long before cloud services appeared on the scene. Now it has become important – in view of the networking of the "Internet of Things (IoT)" – to develop the security of the services even further and turn this aspect into part of the brand essence. The steadily growing number of "connected devices" and the virtualization of IT applications in the cloud will create a situation in which "connectivity" per se will no longer be the sole component of the service. The customers of telecommunications companies will be paying much more attention to other aspects: to what extent can they depend on the security of their data, and to what extent are they able to control where data are stored and processed.

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[4] *Cf. http://www.wired.com/2016/03/fbi-warns-car-hacking-real-risk/?utm_medium=social&utm_source=linkedin.*

An especially vital point in this respect is the verification of the validity of the data that is required. The example of SONY was a clear demonstration that the harm from cyber-attacks is not limited to the damage to the corporate image; it is also important to be able to offer verification of the validity of the data so that the annual financial statements can be certified. Cyber-security services at telecommunications companies have a contribution to make to ensure that end-to-end verification of the data flow and data integrity can be presented. The integration of the data security systems in the IT environment of the company's customers undoubtedly plays an important role here as well.

In a networked economy, however, protecting one's own data is not enough. It must be possible to trust the data from partners and to be able to ensure that their data and applications have not been corrupted. These concerns are leading to the creation of alliances such as the "Deutsche Cyber-Sicherheitsorganisation" [German Cyber-Security Organization] (DCSO) that has been founded by Volkswagen, Allianz, BASF, and Bayer for the purpose of identifying and warding off cyber-risks. This demonstrates that the corporate customers of telecommunications companies are taking active steps to meet the challenge and are looking for additional partners so that all can collaborate to achieve the highest possible level of security.

Telecommunications companies must actively participate in this development. Besides their interest in securing the existing telecommunications infrastructure, further services such as cyber-security (security assessment and protective measures) and safe IT cloud services offer substantial potential for monetarization.

Added value of new technologies in relation to data integrity

In the meantime, solutions such as the "Keyless Signature Infrastructure" (KSI) that secure integrity by means such as hash-value cryptography, blockchains, and calendar time stamps have become available as ways to guarantee data integrity. The advantages of this KSI technology can be found in the creation of data that are forensically auditable – i.e., legally admissible evidence – and in prompt discovery of insider attacks because such attacks, as a rule, cannot be discerned by perimeter-centric processes. Although it does not directly prevent unauthorized actions, it does enable the immediate detection of penetration by attackers and the chance to initiate measures to limit harm in real time.

5 *There were major delays before this became possible at SONY.*
SONY company information: http://www.sony.net/SonyInfo/IR/library/fr/150204_sony.pdf.

6 *Cf. DSCO, https://www.basf.com/de/company/news-and-media/news-releases/2015/09/p-15-342.html.*

7 *KSI ist eine Technologie der Firma Guardtime, https://guardtime.com/ksi-technology.*

KSI technology is based on mathematically proven cryptographic principles and is recognized by such standards bodies as ETSI and NIST. These bodies also predict an end to the RSA algorithm because this method cannot provide security in quantum computing. The mathematical method on which it is based makes the KSI solution "post-quantum proof".

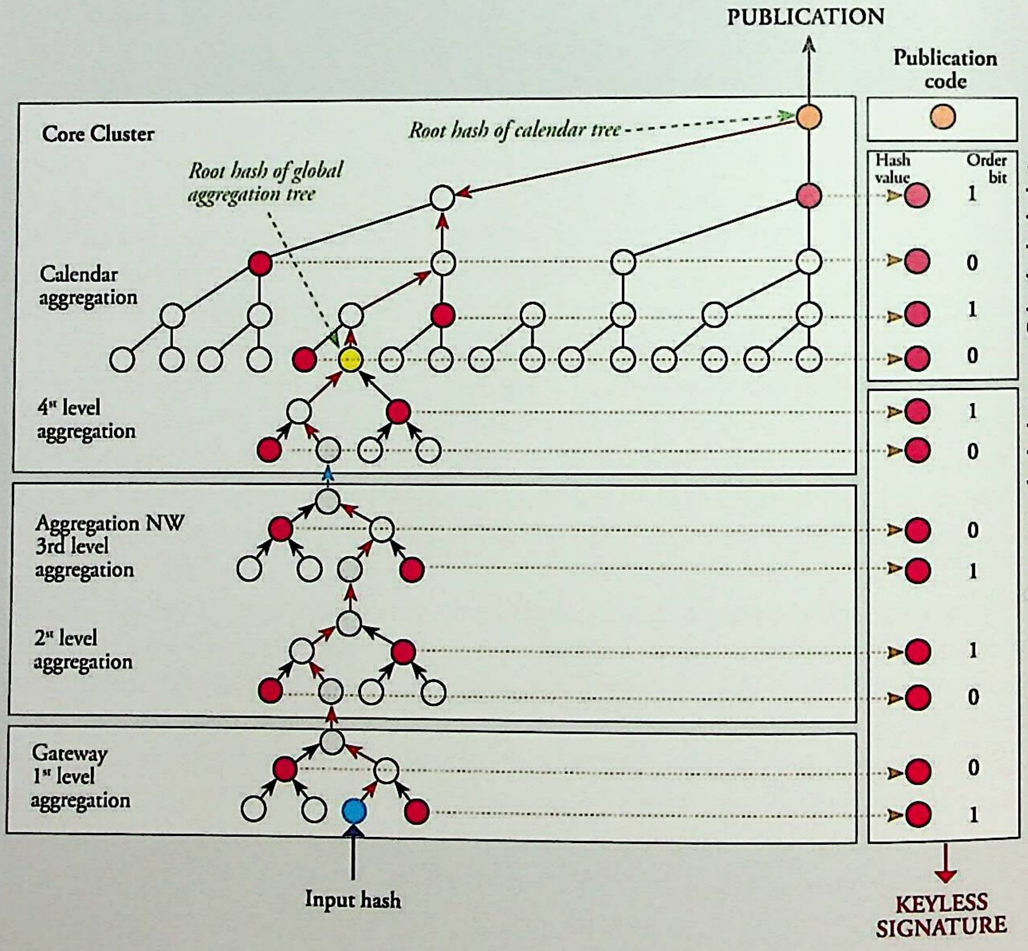
KSI is to be regarded as a supplement to existing public key infrastructure (PKI) applications. PKI was developed to allow two parties to exchange sensitive data across an insecure communications channel. This technology has been highly successful for this particular use case; in other use cases, however, the difficulties are growing, especially with respect to the verification of "data-at-rest". Because of the required scaling from the steadily growing data quantities and use cases, the complexity and costs of key management are making the utilization of PKI technologies increasingly uneconomical. These circumstances have led to the development of KSI technology so that the authentication of private and industrial data becomes more scalable and efficient.

An analogy illustrates how this technology works. Imagine a group of people who suddenly witness a traffic accident. All of these people make statements describing the details of the incident and testify to their correctness. This information is authenticated by a third party, the police, certifying the data. The certified data from all of the witnesses are compiled to form a "signature". Along with the time stamp, the signature created in this way follows these people through their lives, i.e., it is traceable and available as information. If one of the witnesses later changes or denies his or her initial statement, it can quickly be determined who this witness is and what the person's original statements about the incident were. In this case, the contribution of the entire group of people is the decisive point concerning the overall integrity of the information about the incident and clearly shows the difference between KSI technology and other technologies.

If we now consider the group of people in terms of a global application, i.e., an infinitely large number of witnesses for each period of time who provide statements about the location and the incidents and mark their statements with a time stamp, this signature becomes even stronger. In comparison with this process, the previous protection of data such as that provided by PKI is significantly less effective. In this case, a small number of actors authenticate the incident and have the statements certified by a third party. The strength of the authentication is supported by the largest possible number of incidents. This is the added value of KSI technology for data integrity: all of the events from all of the connected systems are aggregated. The reproduction of these values – the decryption of the signature – is virtually impossible because of their complexity and the large number.

In addition to the use of hash-value cryptography, blockchain technology as a public ledger is also used. The KSI blockchain makes it possible to overcome the primary weakness of traditional blockchains: the scalability. Blockchains such as the Bitcoin blockchain grow linearly parallel to the number of transactions. In contrast to this, the KSI blockchain is independent of the number of transactions because it is aggregated across all of the hash values of the events and created per time unit. This assures the performance of the systems that are being protected

Figure: Keyless Signature


PUBLICATION
Publication code
Core Cluster
Root hash of calendar tree
Root hash of global aggregation tree
Calendar aggregation
4st level aggregation
Hash value
Order bit
1
0
1
0
Calendar hash chain
1
0
0
1
1
0
0
1
Aggregation hash chain
Aggregation NW 3rd level aggregation
2st level aggregation
Gateway 1st level aggregation
Input hash
KEYLESS SIGNATURE

Source: Detecon

and is independent of the number of connected units and the volume of the data being protected. The protected data themselves are not transported, only their hash value, assuring compliance with data protection regulations.

Data integrity as brand essence

The security of KSI technology is of course dependent on the ITC environment in which it is used. Telecommunications companies can create this security in the sense of an end-to-end service, supplementing their current data and communications services. This offers substantial potential for differentiation to the competition, especially to over-the-top companies.

Telecommunications companies should therefore supplement their services with a high level of data integrity so that they can decisively answer in the affirmative when asked: "Can I trust my data?"

Daniel Godde is in charge of new services such as the cloud and Internet of Things (IoT) within the Core and Cloud Practice in West and Central Europe at Ericsson. Ericsson supports telecommunications and industrial companies in the creation of success factors in digital business, whereby efficiency, agility, and data security/integrity represent important components. Daniel Godde holds a commercial degree and, before joining Ericsson in 2011, worked for leading consultancies, ICT system integrators, and a global telecommunications company.

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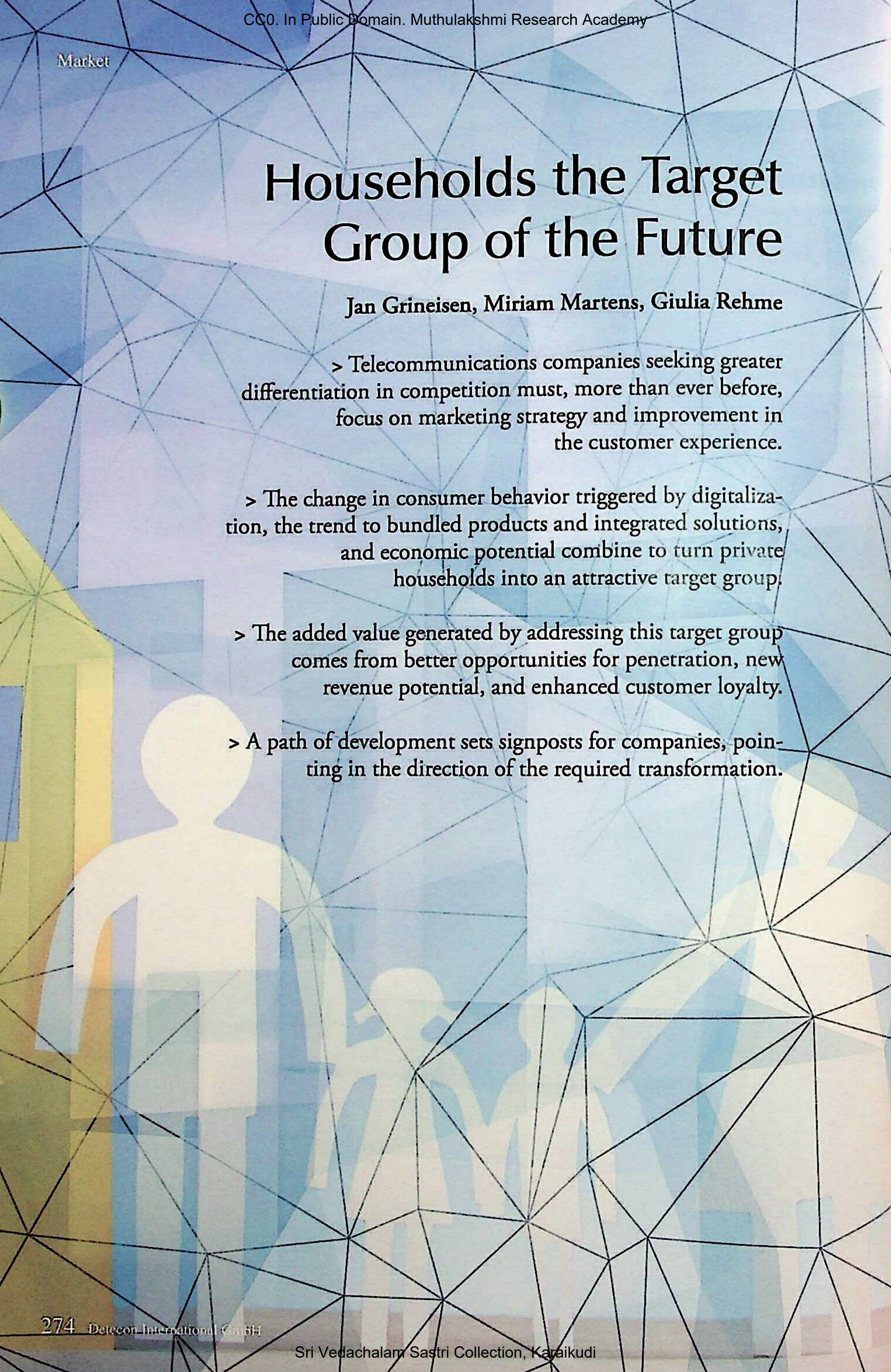

Households the Target Group of the Future

Jan Grineisen, Miriam Martens, Giulia Rehme

- Telecommunications companies seeking greater differentiation in competition must, more than ever before, focus on marketing strategy and improvement in the customer experience.
- The change in consumer behavior triggered by digitalization, the trend to bundled products and integrated solutions, and economic potential combine to turn private households into an attractive target group.
- The added value generated by addressing this target group comes from better opportunities for penetration, new revenue potential, and enhanced customer loyalty.
- A path of development sets signposts for companies, pointing in the direction of the required transformation.

Changes in the competitive situation and new requirements arising from customer behavior are compelling telecommunications companies to rethink their marketing strategy. Telecommunications companies find themselves in direct competition with over-the-top (OTT) providers who are attacking them at the heart of their business – increasingly in the realm of connectivity and not only in communications services – by acting to create their own infrastructure (Google Fiber), to establish mobile virtual network operators (MVNOs), or other measures.

Outstanding customer experience is a source of differentiation in competition

While telecommunications companies traditionally strive to achieve differentiation in the product dimension, the strength of the OTTs is in the fulfillment of customer expectations and outstanding customer experience. If telcos are to hold their own against OTTs, they will have to sharpen their focus on marketing strategy and improvement of the customer experience.* Generating outstanding customer experience, however, is dependent on strict segmentation of customer groups and the segment-specific definition of the marketing mix. The “one size fits all” concept has outlived its usefulness in this situation. Consideration must also be given to the issue of what target group telcos should concentrate on in the future.

The answer will be found in current developments on the part of both customers and providers. The ongoing digitalization is not only blurring the lines between industries, but is also having a major impact on consumer behavior. Consumers are becoming accustomed to the availability and changes of digital services – and becoming increasingly demanding. Of course they want to be able to access the Internet from any place, on any device, and at any time – quite simply, to utilize all of the elements of the ecosystem in every aspect of their lives – but they also want to be able to share their experiences with their families and friends. Moreover, a meshing of the digital ecosystem can be observed – especially among people who live in the same household. Members of such groups jointly use the applications of the digital ecosystem, and telcos address a group of users within (for example) a home base from which every member of the household can network his or her individual device. So digital ecosystems make it possible to satisfy collective as well as individual needs.

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* *Cf. Penkert et al, Telco 2020, pp. 246 in this book.*

Discovery of private households as an attractive target group

Telecommunications companies must respond to this development by addressing groups specifically and can, by focusing on private households as a target group, set themselves apart from the competition.

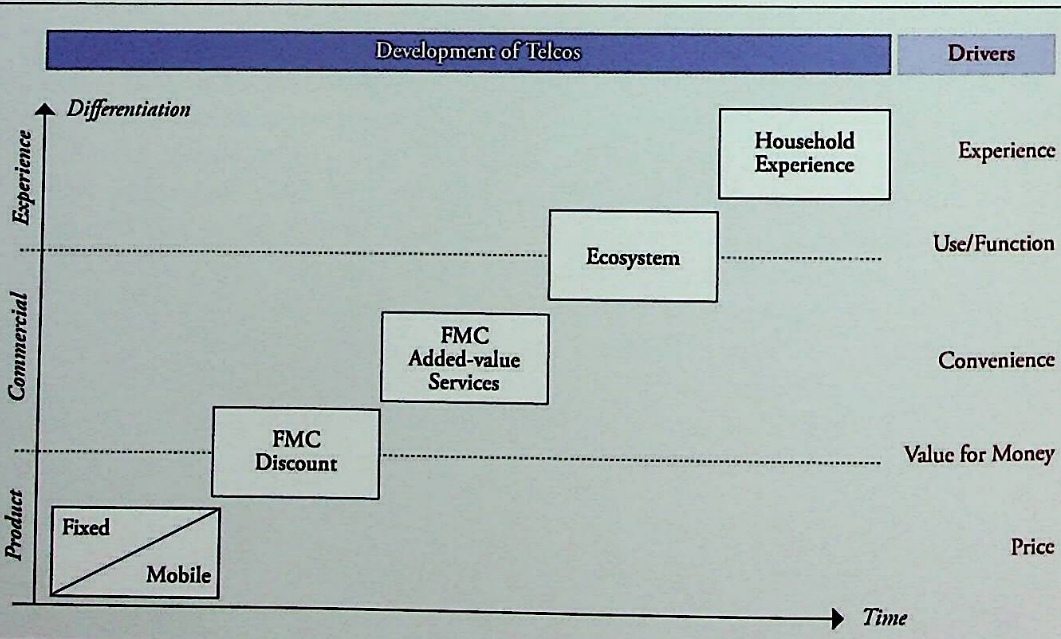
Besides the sizable economic potential waiting to be exploited in households, their relevance stems from the burgeoning digitalization of the households themselves and the rising significance of digital social interaction. The message is addressed to a group of users who live in a single household and jointly use products found there.

What is required is a reorientation of the entire added-value process, from the definition of the corporate strategy to the steering of operating business. The development of the companies follows an evolutionary path in five typical stages (cf. figure).

Stage 1.0: Fixed/mobile stand-alone products

Telecommunications companies used to focus on individual products, the time-honored approach. The portfolio was made up of products such as fixed net-

Figure: Development Path of Telecommunications Providers


Development of Telcos
Drivers
Differentiation
Experience
Commercial
Product
Household Experience
Ecosystem
FMC Added-value Services
FMC Discount
Fixed
Mobile
Experience
Use/Function
Convenience
Value for Money
Price
Time

Source: Detecon

work lines for telephony and mobile lines for telephony, later supplemented by the Internet connections for each. The sole competition was from other players in the telecommunications industry; the products were virtually homogeneous. Pricing was the only way to achieve differentiation in the products and services, ultimately forcing margins downward as the market became saturated. The most important business capability was the guarantee of availability based on the network infrastructure. As a rule, customers were bound to a single provider because of the lack of competition from alternative carriers. Deregulation and the appearance of competitors enabled customers to compare products easily because of the homogeneity in the offerings and to optimize their expenditures as suited them best. This stage culminated in a drastic price war. At this time, service providers such as SmartMobil and Vibe Mobile are especially successful in this stage with their offers of low-price single products for self-optimizers.

Stage 2.0: FMC discount bundle

The second stage consists of companies whose focus is on the convergence of fixed and mobile network products. In this stage, the primary interest is on the provision of fixed and mobile network services as a package at a discount price. Customers are drawn to the highest discount for the offered bundle.

For telcos, this means more in-depth customer penetration from the provision of additional services to current customers and the possible strengthening of customer loyalty. Mobile-only carriers cannot on their own offer an integrated product and remain in Stage 1. One alternative is a partnership with network operators so that an integrated price advantage can be offered to customers. Moreover, telcos gain an advantage because the comparison of the offered services becomes more problematic and they can no longer be differentiated by price alone. Differentiation among the competitors becomes an issue of best value for money. The individual product components still differ very little from one competitor to the next, but the convergence of mobile and fixed networks produces a variety of offered services to match differing customer preferences. Telcos in this stage continue to be oriented to consumers who focus strongly on price.

Stage 3.0: FMC added-value services

The third stage of evolution is based on the previous stage. Now, however, for the first time, telcos attempt to acquire customers by presenting arguments that are not based solely on price. Instead of a discount for the conclusion of a bundled contract, customers are offered a bonus in the form of additional services at no extra charge. Services that are hardly ever booked by customers and will be seen as hygiene factors in the future (e.g., unlimited calls from fixed to mobile networks, higher LTE data speeds, or an improved level of customer support) are particularly suitable for such offers. The goal of a bonus of this type is to provide a higher level of service to customers and to shift customer focus from price to quality or scope of the services. The benefit for telcos is in the potentially greater customer satisfaction and reduced comparability with competitors' offers.

The key factor for success in this stage is convenience in customer communication, whether in the form of services and products from a single source on one invoice or worry-free surfing with an unlimited data rate plan. Customers are no longer addressed solely by a low price; the added-value services are a further attraction.

Stage 4.0: Ecosystem

The fourth evolutionary stage is characterized by telcos supplementing their bundles of FMC added-value services with further added-value services that move farther away from the core business, including music streaming, video on demand, or smart home. The goal here is to cover a constantly expanding part of customers' digital lives, creating as a whole a higher added value for customers and simultaneously the share of wallet for the telcos. When telcos begin offering these services, they enter into direct competition with other providers who have comparable services and products. Telcos must therefore move in the direction of matching customer demands by building up ecosystems and integrating the offered services.

In most cases, the integration of products and services in this stage takes place on a cloud-based platform. Essentially, these ecosystems – most of which are closed systems – integrate devices, connectivity, services, and content to cover four stages of the digital added-value chain and make it possible for customers to obtain all digital products and services from only a few or even from one single provider. The ecosystem is a central component that makes use of many different features to create a uniform sense of utilization for customers, enhancing the customer experience; examples include a single sign-on for all services (including partner services), centralized support, and a standard self-service interface. The integration of added-value services can be realized by the telcos' own efforts or by concluding strategic partnerships. By seamlessly integrating all of the products and services into one ecosystem, telcos can generate a lock-in of their customers because they can offer the entire digital added-value chain, a complete digital life, to end customers – a "digital life aggregator", so to speak.

The industry's initial movements in this direction are already foreseeable. Tele Danmark Communications, Portugal Telecom, and Deutsche Telekom, for example, are steadily expanding their FMC bundles by including more added-value services. This is achieved either through standard processes and features such as centralized customer support or on the basis of hardware in the form of set-top boxes. OTTs, however, are already much more firmly established in this sense. Apple uses its devices, content such as HomeKit and iTunes, and iCloud as the connecting member of the ecosystem to cover virtually every link of the added-value chain.

The products and services offered at this stage are in direct competition with services and products from the OTT competitors such as iTunes, Free-Box, and Google ChromeCast. The offer enables customers to procure all of the desired services from fewer and fewer providers – in the best case, from one and one only. This is how telcos can strengthen the bonds tying customers to them.

Stage 5.0: Household experience

In the fifth and final evolutionary stage, the imperative for corporate development is in the intended customer experience. The prerequisites were created in the previous stage by the establishment of an integrated ecosystem. While such a system takes advantage of numerous features to offer a uniform utilization experience to customers, there is still no address of the individual through measures of communications, product, and distribution policies. This occurs in Stage 5 when private households are specifically addressed. Conversely, this entails the deliberate decision to address other target groups such as private individuals and self-optimizers separately, e.g., using a differentiated offer or second brand.

A new segmentation strategy promises a more specific address of users in their social context, an approach that can make it possible to achieve a higher level of customer satisfaction for the entire household as a utilization unit. The determined orientation to the offering to households thus makes it possible to create social added value for customers and to enhance the customer experience significantly. In their contest with the OTT competition – which has begun to offer connectivity services with the name Google Fiber, although as of this time exclusively in the USA – telecommunications companies can play an important trump card: they already have customer relationships in place, and their fixed network lines represent the foundation of their customers' digital lives. An eco-system focusing on households, for instance, would offer a mobile services contract for every member of the family, a joint broadband line, and television (all of these services billed on a single invoice), single sign-on covering partner services as well, content such as music or video streaming, and individual services that can be used and shared at no charge among family members. Moreover, the functional integration of the services in the world of fixed and mobile networks or the relevant devices is possible. As of this moment, no telecommunications company has reached the fifth stage of evolution. Initial movements in this direction are already discernible, however. One example is the rate plan Red+ from Vodafone; it permits family members to share their data volumes with one another.

OTT providers have long since focused on groups of people who are closely involved with one another in real life. Apple, for instance, provides Family Sharing, the opportunity to share and utilize apps within the family. Amazon is also attempting to address collective needs for jointly used services as well as the individual needs related to content. Amazon Prime members can share their shipping benefits with the members of their household while the content services such as Prime Video and Prime Music can be utilized within a customized profile.

Addressing private households specifically creates added value

The specific address of households as a single entity and the simultaneous address of every single member of the household as an individual lay the groundwork for long-term differentiation from the competition. One aspect of the added value for telecommunications companies is in the better penetration of the target group because addressing the entire household can open up access to new family members who currently still have contracts with competitors. Another is that new revenue potential can be exploited, e.g., by the integration of mobile and fixed network customers within a household as well as the upselling of services and products. Finally, the offering of integrated, personalized services can erect barriers to churn and bind the customers emotionally to the company. So the strengthening of customer loyalty is a third added value.

What initial measures should telecommunications companies now initiate to win over entire households and to set themselves apart long-term from OTTs and other telcos? The first step is to set their own company on the path of development. Once this has been achieved, it can be used as the starting point for identification of the next steps. Integrated telcos follow the described path of development in sequence and as a rule do not "leapfrog" to a higher stage of evolution. Every stage of evolution comes with its own challenges for transformation. Parallel to their progress, telcos must define their vision. That includes the nature and structure of the ecosystem, deciding what they want to stand for in the eyes of their customers, and what customer experience they want to generate.

Just like any other transformation, orientation to the household experience begins with the determination to rethink current positions and the will to challenge the status quo.

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Telco Focus on Business Customers

Carsten Glohr

- Telecommunications companies must constantly adapt their business models to maintain their position in the business customer segment.

- Disruptive effects appear imminent in the three major business segments network services, software services, and computing services.

- Partnering secures an attractive market position in all three business customer segments for telcos.

Telecommunications companies must constantly adapt their business models to maintain their position in the business customer segment. The three major business segments are network services, software services, and computing services. Each of the three business segments is facing its own imminent disruptive effects that are explained in more detail in the following:

- > Disruption in the network service segment from Intercloud;
- > Disruption in the software services segment: IoT and digital Darwinism;
- > Disruption in the computing service segment: cloud brokerage and automation.

Disruption in the network service segment from Intercloud

The forging of international alliances has always been an important factor for the success of providers in the business customer segment. In most cases, a provider can be successful in a bidding competition only if it covers international lines with the help of low-cost price structures from its international partners. Most network tenders contain international sections and can be won only in cooperation with experienced international partners who can be subcontracted quickly enough at competitive prices. Once only the case for the large customer segment, this situation has now become true for small midsize business customers as well. Even these businesses often have a large number of offices abroad that must be equipped with low-price WAN lines as part of an offer.

To paraphrase Porter,[1] a company will not be capable of survival unless it seeks a position as either a cost leader or a service differentiator in comparison with its competitors. Both at the same time are not possible. Moreover, the chosen position must be one that cannot be imitated – or can be imitated only with great difficulty – by competitors.

The cost leaders for specific lines in the bidding competition are usually local WAN providers who are at home in the particular region and consequently have the highest PoP density. As a rule, these providers require the shortest "local loop" for the connection of the customers' business sites over the expensive "last mile" and are therefore the least expensive.

The special trick for the "Intercloud" strategy is that these local cost leaders can be interconnected to form a global alliance. The Intercloud alliance partners can

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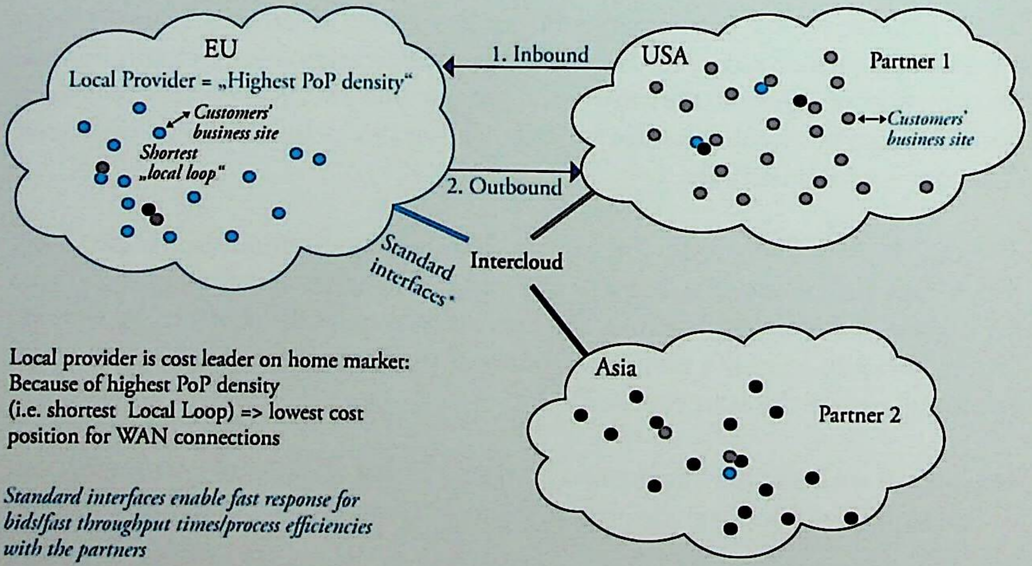
[1] *Michael Eugene Porter is a visionary and university professor for economic science at the Institute for Strategy and Competitiveness of the Harvard Business School.*

then offer the lowest price at all times and in any region. This "market-clearing" characteristic is interesting above all in the business customer segment because larger business customers often require a large number of international WAN lines to connect all of their business sites with one another. Even small midsize businesses are usually active in many countries today. Globally operating telcos therefore have a decisive advantage in the business customer segment. They are the only providers who can offer competitive prices for the international aspects of tenders. Locally operating telcos, on the other hand, can easily price themselves out of the market because they cannot offer the international services except at prices that are inflated several times over or with poor response times because of complicated partner structures.

International alliances in the business customer segment have always been a reliable means of winning contracts in bidding competitions, of course. But Intercloud is generating completely new dynamics here. Since the forging of strategic alliances with international partners has in the past been individual, pragmatic, and quite frequently different from one customer to the next, the approach has led to an impenetrable jungle for larger telcos with over 100 partners and to interfaces among the various partners that are in most cases significantly less than professional.

Figure 1: Intercloud-based Global Alliance Formation with Local Cost Leaders



Local provider is cost leader on home market:
Because of highest PoP density
(i.e. shortest Local Loop) => lowest cost
position for WAN connections

* *Standard interfaces enable fast response for bids/fast throughput times/process efficiencies with the partners*

Source: Detecon

The Intercloud has a standardizing effect in this case. Any alliance partners all use the same standards. The Cisco Intercloud, for instance, is based on "Open Stack", a cloud framework that among other features has a standardized mimic for provisioning services. Price information can also be shared quickly among the alliance partners – an important speed advantage during bidding competitions when time is often critical. Other processes as well as the preparation of quotations can be strongly accelerated. This is especially true of service management and delivery processes. Commercial and technical orders such as SLA and billing data can be exchanged automatically. If the partners have software-defined networks that have been calibrated with one another, even the provisioning of lines in just seconds is possible under certain conditions. An invaluable competitive advantage!

Intercloud alliance partners can in this way jointly improve their international competitive position. The local partner receives additional "inbound"[2] business from alliance partners whose customers require WAN lines on its home market. At the same time, the local partner is in a position to offer competitive prices in the additional "outbound"[3] business for lines that it could normally not offer competitively without the alliance.

Assuming a high speed of implementation, the result is a superior business model for telecommunications services in the business customer segment.

Disruption in the software and service segment: IoT and digital Darwinism

Digital business models have long had a disruptive impact in many industries – including industries where IT has previously been viewed as a "commodity". There are many products that from now on will no longer be competitive unless they have been digitally enhanced. In the future, however, not one single industry will be able to evade the far-reaching impact of digitalization. IT service providers must understand the extent to which their customers' established business models are being questioned and traditional corporate structures are being challenged. If they succeed in reaching this level of understanding, it will open the door to tremendous opportunities to provide innovative services enabling digital transformation for their customers and assuring their own success.

The first wave of digital Darwinism affected above all those industries whose products and services could be completely digitalized. If an industry's products were not physical – MP3 from the media industry and banking services are examples of such products – they could be distributed completely in digital form. The consequences were highly disruptive effects and the unparalleled triumph of online business models. Most business processes today are handled by the customers themselves using fully automated self-services without involving any bank personnel at all and at a fraction of the transaction costs previously charged.

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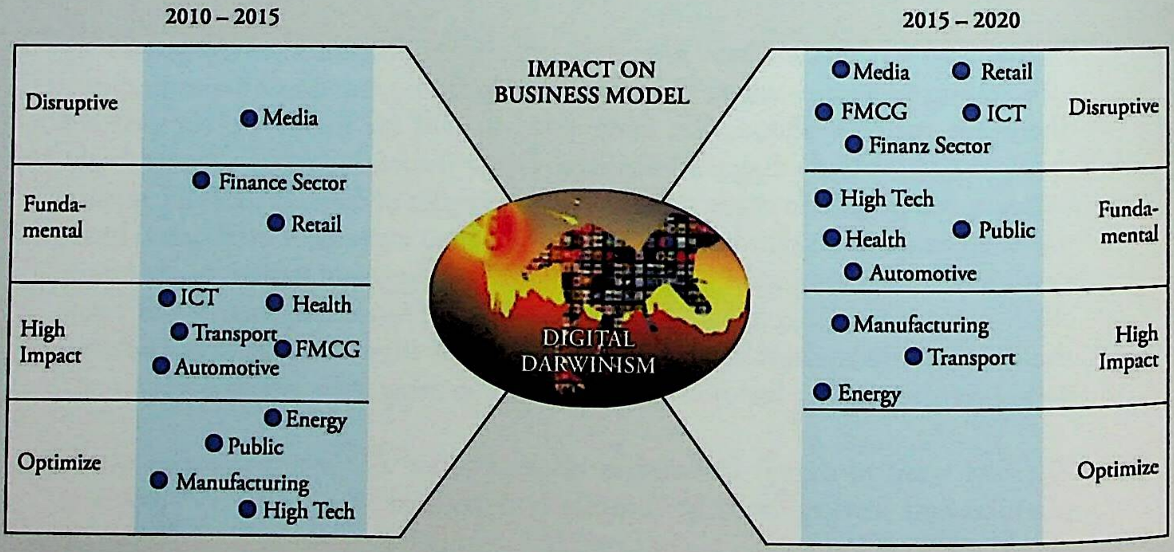
[2] *Inbound: A foreign company buys a line on the provider's local home market for the connection of its business site.*

[3] *Outbound: I: A domestic company buys a line abroad (as a rule, via the foreign partner of the domestic provider) for the connection of its foreign business site.*

Industries that produce physical products were initially less vulnerable to the substitution of digital business models. Traditional industrial business models in manufacturing, automotive, or energy industries appeared to be comparatively safe because their products are physical and digital distribution is hardly possible. Moreover, many of the products in these industries are highly complex and expensive so that the availability of information on the Internet offered little differentiation in competition.

But the second wave of digital Darwinism that is on its way will have a massive impact on these industries as well. Even traditional industry is feeling the increasing competitive pressure from smart service providers such as Google and the American domination in this sector. Physical products will also be increasingly

Figure 2: Triumph of Digital Transformation


2010 – 2015
Disruptive
Media
Funda-mental
Finance Sector
Retail
High Impact
ICT
Health
Transport
FMCG
Automotive
Optimize
Energy
Public
Manufacturing
High Tech
IMPACT ON BUSINESS MODEL
DIGITAL DARWINISM
2015 – 2020
Media
Retail
FMCG
ICT
Finanz Sector
Disruptive
High Tech
Health
Public
Automotive
Funda-mental
Manufacturing
Transport
Energy
High Impact
Optimize

Source: Detecon

interconnected by the Internet of Things (IoT). Complex, expensive products in particular contain a high proportion of IT value generation. Car IT or machine controls are two examples. The relevance of these digitally charged products will only grow greater and play an increasingly significant role for differentiation in competition. The technology corporation Bosch, for instance, is investing about €500 million annually in projects far removed from its core business so that it will be able to compete with Google, Apple, and other companies in networking business and the Internet of Things.

Increasingly greater shares of the IT budgets are flowing now into the interconnection of customers, products, machines, and means of transport. Simultaneously, many "things" are also producing huge quantities of data. A modern elevator with IoT capability, for instance, is equipped with well over 100 sensors that generate a continuous flow of data, so big data solutions are definitely a growth field along with IoT solutions. Above all, those providers who in this sense are able to create standardized platforms and secure their intellectual property through licenses and theft protection will profit from this development. "Partnering" is the supreme event here because virtually no one acting alone is able today to cover comprehensively all of the required IoT core competencies such as industry applications, connectivity platform with identity management, interconnectivity, end device integration, or big data. Even the "big boys" of the industries cannot usually manage without the cooperation of partners.

It is true that there will be opportunities in the IoT environment for all possible business models of the ICT providers. But above all the software providers will be the ones who are able to move into a truly good competitive position. In the spirit of Porter, long-term success will be achieved only by those providers who offer functions or technical services that can be permanently protected as intellectual property rights or are difficult for competitors to copy because their source codes are secret.

These providers can earn good profit margins through licenses or SaaS models. SaaS solutions in the IoT sector are especially promising. SaaS/IP protected providers often offer system integration services as well, but solely in the form of opportunistic cross-selling products. By themselves alone, software integrator business models will hardly be able to survive unless they can offer comparative cost advantages such as low labor costs of offshore providers.

IIn many cases, system integrators have a chance for survival, but will be forced to seek price leadership on a low-margin market (producers). This will become all the more apparent the faster IoT standards become established. The expenditures required for system integration will decline further with every IoT component that has "plug and play" capability.

In the long run, software providers will dominate the IoT market because they have the best software development competence and already today have profound knowledge of customers' business processes. This puts them on the inside track for optimization of customer processes through the interconnection of products, means of transport, and machines.

Telecommunications companies can best maintain a permanent place on the market by creating their own connectivity platforms and providing actor-sensor data. These kinds of solutions can be sold most skillfully through sell-side partnering. The connectivity platforms are integrated into the software solutions for optimization of customer processes. Every time a software package is delivered by the sell-side partner, the corresponding connectivity platform can be sold as well. Buy-side partnering may play a role here as well to compensate for the lack of in-house competencies, but it weakens a company's own USP to the benefit of the buy-side partner.

Networks with low latency times, high security standards, and precise mobile location services can be differentiating capabilities in the area of network technology. Such "tactile networks", however, will most likely become standardized very quickly. In the spirit of Porter, cost leadership will be the sole means of securing a permanent competitive position because on a highly standardized market service differentiation will become increasingly difficult and even tactile network connections will be nothing more than a "commodity". A decisive competitive advantage, however, can come from fast and highly-automated provisioning of services with the aid of software-defined networks.

Disruption in the computing service segment: cloud brokerage and automation

A ruthless price war has long dominated the computing services segment. Traditional outsourcing solutions in the IT infrastructure segment have been suffering from a rapid decline in prices for many years. It is not at all unusual to see the market prices for bandwidth, storage, and computer services fall at a double-digit percentage rate within a single year. The continually rising offshore quotas result in falling prices even for services requiring intensive personnel resources.

Since the products such as computing performance and storage are highly standardized and virtualized, the lowest-price provider on the market (cost leader) frequently wins. Providers who can continuously underbid their competitors in the price war in the "commodity" segment because of comparative cost advantages or effects of scale are successful. Even for them, however, the market is one of low margins and intense competition.

There is a probability that so-called (cloud) broker models will appear, above all in the computing service sector. Based on customer requirements related to service levels or performance, broker software attempts to find the appropriate IaaS (Infrastructure as a Service) solution, checking as well the public cloud services offered by Eucalyptus, Amazon Web Services, Microsoft Azure, and other providers. As necessary, existing internal on-premise installations can also be integrated. Many providers have already started setting up brokerage services of this nature.

The competitive advantage is in the fast, fully automated, and therefore error-free provisioning that, as a bonus, does not require any personnel. Modern IT factories can operate virtually free of any manual system administration activities and are based on comprehensive full automation. IT employees instead realize administrator activities as source code in an application that autonomously and fully automatically provisions the software programs and other infrastructure resources. Where providing a server previously took 100 days, the provision is now possible immediately without any expenditure of manual labor and in error-free quality through applications or shop solutions. The important point for modern IT factories is rigorous standardization, modularization, and consolidation of services; this in turn has a positive effect on a large number of different cost drivers.

These highly standardized cloud provisioning paths, however, must be enriched and refined by the appropriate services because many large customers demand solutions tailored to their needs, even though a standard service is at the heart of the solution.

Full-service providers must decide on a reasonable production depth. If they can fall back on sufficient cost advantages, they can operate as cost leaders – but this will presumably be true of only a very few. Otherwise, they are forced to assume a broker role for their customers, ideally with largely automated, integrated solutions from the cost leader partner with the lowest price. This is how, for example, highly automated IaaS and PaaS (Platform as a Service) services are provisioned. The data are then migrated and tested (service refinement).

This trend is not really new and the compulsion toward perfected industrialization is a task that every provider is compelled to tackle by creating the most optimal set of internal processes possible. It is becoming evident, however, that traditional outsourcing business models are no longer viable as future alternatives because of the accelerating innovation cycles on the market. Corporate applications, for instance, are more and more frequently being offered in the form of SaaS (Software as a Service) models from the cloud by SaaS providers with the consequence that end customers no longer procure their IT operations from their traditional outsourcing partners, but acquire them instead as an SaaS package from the software provider. The traditional outsourcing providers are rapidly losing their infrastructure-related business to SaaS providers, and the outsourcing business is being replaced more and more by the cloud business. It is only a matter of time until traditional IT service providers will have lost major shares of the IT operations of their current clientele to SaaS providers. Traditional computing service providers find themselves more and more without a viable business model and have no choice but to reinvent themselves.

Since many software providers view the development of software as their actual core business and have little competence and interest in operating IT systems for their customers, new outsourcing opportunities are appearing here. Computing service providers have the opportunity to sell IaaS and PaaS services to SaaS providers or to integrate attractive production packages across the entire SaaS, PaaS, and IaaS stack into a partner model. The structure of the ICT provider's clientele will also undergo major change as a result, however. There will be fewer and fewer large outsourcing deals with end users; they will be replaced by more partner agreements between SaaS and IaaS/PaaS providers or by a large number of standardized SaaS agreements, each covering only a small area, with end users. It is obviously foreseeable that IaaS and PaaS providers will be able to survive solely by operating jointly with SaaS providers in partner models.

PaaS and IaaS service providers, above all in the area of computing services, must rigorously transform their traditional business models into partner models and simultaneously strive to secure cost leadership through strict automation, effects of scale, and high near-shore and offshore quotas.

Partnering secures an attractive market position in the business customer segment

The greatest competitive intensity rules the computing service segment. Providers such as AWS[4] have long been offering a highly standardized, low-cost service in a fully automated provisioning function and are increasingly bold in launching a frontal attack on the traditional infrastructure providers. Surviving in this environment means implementing cloud brokerage and automation functions and building up partner structures with the most important cost leaders on the market before it is too late. Traditional outsourcing business is being replaced in more and more cases by XaaS models.

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[4] *Amazon Web Services.*

An effect similar to that in the network service segment will appear from software defined networks. In the future, it will be possible to provision software defined networks that are more fully automatic. Telcos can learn much from the difficulties and the survival strategies in the computing service segment where competition is substantially more intense. Similar fully automated provisioning is moving into the network service segment as well. Thanks to the Intercloud-based creation of global alliances by local cost leaders, the cutthroat competition will intensify. Strong Intercloud alliances will emerge as the victors when the dust clears.

The software and service segment, especially with regard to the subject of IoT, is dominated by a gold-rush atmosphere ("it's land-grabbing time"). The diversity of the players bustling around on the IoT and Industry 4.0 market is almost infinite. The most important are industry automation providers like Bosch and Siemens, software providers like SAP and Microsoft, OTTs like Google, and telecommunications providers like Vodafone, Deutsche Telekom, and British Telecom, not to mention a huge number of specialized providers.

In the long term, however, the winners in the business customer segment will be the software providers along with the providers who are able to protect their competitive position by means of intellectual property rights. Software providers today already have their anchors set most firmly in the verticals through their software solutions. The software solutions support many of the business processes of the customers. IoT solutions must integrate themselves into these processes. Telcos should turn more and more to sell-side partnerships with software providers because this is the approach that seems most likely to result in large-volume business. As long as there is so little standardization on the market, the direct distribution channel can be taken as a pathway to the customers, cooperating with customers to realize tailored solutions – to acquire the necessary know-how, if for no other reason. Large-volume business would appear to be a rare occurrence for telcos in this area, however; the possibilities for productization are limited. Still, if software providers are carefully selected for partnering, viable products can be realized.

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„Seizing All of the Opportunities Offered by Digitalization“

T-Systems has launched the program All-IP to carry out the IP transformation. The company has set for itself the task of working jointly with its customers to prepare the various steps of IP migration. The objective is to develop IP complete solution concepts for individual needs in the customers’ voice and data communications. **Werner Eduard Gabriel, Vice President All-IP & Service Conception and Program Director All-IP at T-Systems GmbH,** shows how business customers can be professionally prepared to make this conversion and proactively guided through the process.

·T··Systems·

Interview

Question: The Fourth Industrial Revolution is based on digitalization. What contribution does All-IP have to make in this context to digitalization? What benefits do companies have from All-IP?

W. E. Gabriel: By implementing All-IP, we can create the infrastructural prerequisites for the new digital revolution in business in the telecommunications sector. The conversion to IP-based networks opens up many new and diverse areas of opportunity for new business models to enterprises. They include greater bandwidths and the flexibilization of telecommunications utilization. All-IP enables dynamic provisioning and forms a future-proof platform for cloud-based services.

Question: What goals is Deutsche Telekom pursuing with All-IP?

W. E. Gabriel: The legacy systems that are still in place have long since passed the zenith of their performance life. We are taking the step of a future-proof infrastructure so that we can guide our customers during their conversion to digitalization and cloud services. Deutsche Telekom is carrying out a consistent implementation across all of the market segments: private customers, business customers, enterprise customers, and the wholesale sector.

Question: How high is the response from the market on the customer side?

W. E. Gabriel: We have noted that customers have a sizable need for information. Customers recognize the relevance and want to understand in greater depth the impact on their business. We offer various information and consulting formats such as special customer workshops, expert seminars, workshops on design, and projects. The response from our customers is excellent and encourages us to continue on the course we have chosen.

Question: What challenges arise when dealing with customers in the business-to-business sector?

W. E. Gabriel: The challenge for enterprise customers arises from the conversion of legacy service infrastructures that have grown up over decades. The entire inventory of connectivity and voice services must be examined and changed to a future concept. We do not recommend here a one-to-one migration of the network infrastructure. The better choice is to seize all of the opportunities offered by digitalization. What is needed are visions and concepts that provide for the replacement of obsolete legacy structures while simultaneously moving in the direction of a groundbreaking, sustainable platform that is capable of supporting all of the coming services of digitalization without any trouble.

Question: How do you classify the competitive behavior with regard to All-IP?

W. E. Gabriel: Naturally all of the competitors also regard All-IP as an opportunity on the business customer market. We see here two groups of competitors: the ones who have become active and the ones who are still waiting. Like us, the active ones are proactively pushing the conversion to IP. The waiting ones are attempting to use legacy products and services as a lure. But that does not provide a substantive solution to the issue. The time has now come for companies to work actively on the conversion to IP.

Question: How great is the transformation task for T-Systems with respect to its enterprise customers?

W. E. Gabriel: Very great. This prompted us to start preparing for the migration years ago. Even though the dimension of All-IP migration is a unique challenge, we are exploiting the experience from other transformation projects. We can also profit from the experience of other segments within Telekom Group or of other providers.

Question: How is the migration at T-Systems proceeding?

W. E. Gabriel: The migration at T-Systems is very sharply focused on customers. In cooperation with the customers, customer-specific concepts are prepared on the basis of blueprints and then realized. Our migration is in effect the sum of the many and varied single migration projects of the customers that we steer via multi-project management. The important task of multi-project management is not just the success of the single projects, but extends as well to the transfer of know-how among the single projects.

Question: What success factors are decisive during All-IP migration for telecommunications companies?

W. E. Gabriel: One of the greatest success factors is the early involvement of the customers because the customers need time for preparation on their part as well. We also refine our blueprints on the basis of the first pilot projects so that we have a verified basis for subsequent projects.

Question: What challenges appear during product development so that an All-IP portfolio can be offered?

W. E. Gabriel: The migration planning for our customers draws on the planned future results of product development. This requires a high level of coordination between product development and migration planning. We always keep a watchful eye on the status and results of product development during our planning of the customer migration.

Question: What is ahead for the sales staff when advising customers?

W. E. Gabriel: The sales staff is continuously trained to work with a new portfolio. Profound knowledge about the new products is important so that the sales staff can access authentic knowledge. The customers' information needs should be met with competence, high transparency about the subject, possible solutions, and appropriate substitutions. The support of professional sales units that we have set up at T-Systems is available to the account areas when complex topics are involved. But All-IP also offers an opportunity to account managers. When All-IP is in place, they can position themselves as trusted advisors to customers. The important point is to create an atmosphere in which information is provided in a spirit of trust and for the customers to feel that the sales counterpart is taking good care of them.

Question: What capabilities must the delivery units build up so that the migration can be carried out efficiently?

W. E. Gabriel: The delivery – i.e., the technical realization units – faces high demands with respect to the project load. The important point here is to make determined use of the lead-in time and to stay in step with customer development. That is why delivery frequently steps in very early when projects are starting up and becomes involved in the bids during the tender phase. It is important for capacity management to obtain a realistic image of the migration challenges because realization of high quality and in compliance with deadlines is otherwise not possible.

Question: How must we imagine the migration of mega enterprise customers?

W. E. Gabriel: The migration of mega contracts is similar to a complex redesign of the networks for key accounts. The challenge in this case (besides the success of the single projects) comes especially from the complexity arising across a number of projects and dependencies. As a rule, we work closely with a project organization of the customers in the single projects. The multi-project management covering a large number of different customer projects requires the proactive management of all dependencies.

Question: In what direction must carriers develop their skills so that they can convincingly serve business customer with IP?

W. E. Gabriel: The securing of critical skill groups is especially important in the voice sector. This is where the business models of both carriers and customers are changing the most. Voice as a service is changing, project work is becoming more demanding, and operations are also undergoing fundamental change in their nature because of the IP basis.

Question: What special organizational features are expedient for giving wings to the All-IP transformation of enterprise customers?

W. E. Gabriel: The foundation is a scalable project organization that seamlessly adapts to the various ratios of size in the customers' business. The special requirement of All-IP migration is in multi-project management. The organization in its scope must create and maintain transparency across all of the migration projects and at the same time secure an overview of the sum of the effects from the many different customer projects going on at the same time.

This has prompted us to come up with a central program for the migration so that it can be carried out efficiently and learnings can be collected quickly and passed on. It encompasses line and business departments that maintain and care for the required customer relationships.

Question: What are the most important KPIs for assessing the progress of the migration?

W. E. Gabriel: The classic KPI for a migration is of course the degree of conversion or realization. However, migration is not a one-dimensional process; quite the contrary, multiple effects from the customers' sphere, R&D, sales, technology, and the IT department must be taken into consideration. At the same time, the KPIs in an effect chain have a contextual relationship. For instance, customer readiness for a conversion is strongly dependent on the number of first-information workshops or follow-up consultations. Conversely, a degree of implementation in technology cannot take place without the conclusion of a contract on the customer's side, and this is in turn dependent on the number and quality of the IP tenders.

Such relationships must therefore be mapped as effect chains in the KPI system. One must never lose sight of the entire web of relationships, i.e., the coherence of the KPI system is frequently more important than specific KPIs.

Question: How does a carrier achieve efficiency with All-IP?

W. E. Gabriel: One way is to use blueprints for challenges that repeat over and over. Blueprints contain a problem solution path that – examined and finely tuned through empirical experience – is employed and played back in new migration cases. In addition, commissioning and change processes must be automated as far as possible as this brings about additional economies of scale. For certain areas, the temporary creation of closed-shop organizations that specialize exclusively in handling the conduct of migration projects is a possibility.

Question: What do you advise enterprise customers to do when engineering the migration in their companies?

W. E. Gabriel: First of all, I advise customers to schedule adequate preparation time for the migration and to make full use of it. It is important to have a clear vision so that the opportunities of the All-IP migration can be exploited. This vision is oriented to the future communications and IT services as well as the infrastructure (such as the cloud) that will be used. This all means that a one-to-one migration is frequently inadequate. Taking advantage of the changeover to All-IP as a chance for the transformation to more extensive services in other application areas as well is rewarding. Once again, it is important to start at an early stage and not to wait until just before the technical migration.

Werner Eduard Gabriel is Vice President All-IP & Service Conception and Program Director All-IP at T-Systems GmbH.

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From the Technology Organization to the Network Factory of the Future

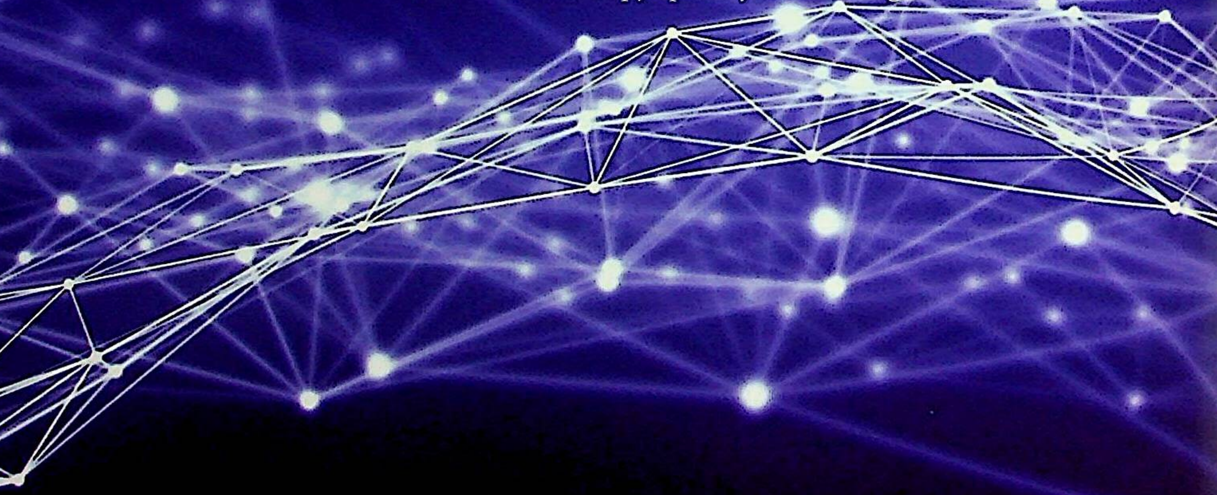
Jörg Borowski

> Telecommunications companies have the chance to be the central hub of digitalization in the future.

> The key to this opportunity is in the successful implementation of SDN and NFV. These new technologies can be used to build up a network factory that is highly automated and centralized. In addition, 5G is the framework enabling mobile networking for the Internet of Things.

> The structures that have long provided reliable service have come to the end of the road. The prerequisite is the transformation of the technology organization, including a fundamental revamping of structures that will affect all of the functional departments and tasks in the organization.

> The goal is a network architecture in which customer-specific 5G and IoT solutions will be offered from a cloud. This will guarantee a market position that competitors will not be able to copy quickly – and long-term success!



The technology organizations of telecommunications operators are about to find themselves in the greatest restructuring program of their history. Following the dismantling of legacy infrastructures used to handle circuit-switched telephony for more than 100 years,[1] the conversion to packet-switched all-IP networks is still far from completed, yet the next revolution that will fundamentally question established principles is already looming on the horizon.

The digitalization of all of the areas of our economy and society will mean a completely new order in the ecosystem of telecommunications providers. Competitors, above all the "over the top" providers (OTTs), are pushing their way into the core business of network operators. New, digital worlds are being created, open to everyone and marked by systemic thinking in terms of partnerships.

Telecommunications companies have a great opportunity to act as the central enablers and to connect everything with everything else. The communication of machines with machines will have a key role to play, one that will result in new demands regarding the number and quality of connections. Latency times and the speed for the establishment of connections will play an essential role and enable new applications such as autonomous driving. The traffic patterns in networks will undergo a profound change. Completely new business models must be supported.

All of these factors will put telcos in the position of a central hub of digitalization. The key to this positioning is in the successful implementation of new technologies that are already available today, in the year 2016: the visualization of functions and the management of networks. Software defined networks (SDN) and network function virtualization (NFV) can be used to create a highly automated and centralized network factory.[2] Moreover, universal, mobile connectivity will soon be available with the introduction of 5G, and the Internet of Things will become reality.[3]

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[1] *Cf. The first automated switching system for telephony began operation in Germany in 1908; source: https://de.wikipedia.org/wiki/Geschichte_des_Telefonnetzes.*

[2] *Cf. Schnitter, Bornhauser, Future Network Architectures, in: Future Telco: Profitability in the Telecommunications Industry, Detecon Publication, 2014, pp. 34 et seqq.; Gonsa, Chrestin, Reith, Virtualization Is Transforming the Telecommunications Industry pp. 58 et seqq; Markova, Schnitter, SDN and NFV.*

[3] *Cf. El Hattachi, Schröder, 5G, pp. 38 in this book; Gonsa, Industry Requirements: The Drivers of 5G Development, in: Future Telco Reloaded: Strategies for Successful Positioning in Competition, Detecon Publication, 2015, pp. 80.*

What all of these technologies have in common – they follow fundamental principles that are essential for the build-up and operation of an operator's network factory:

1. Standardization: Proprietary systems will be pushed aside by standardized solutions. The diversity of the components in use will be reduced; the components themselves will become more homogeneous. Open source principles will replace closed solutions in the manufacturers' ecosystems. Interfaces will be standardized, complexity reduced, costs lowered.

2. Automation: The exponential rise in the number of endpoints in the network and the differentiation in network performance can be mastered only if the processes in networks are highly automated. Automation shortens the process running time, cuts costs, and increases speed.

3. Centralization: The decoupling of traffic and control will centralize functions and network elements such as data centers and network operation centers (NOC). The more extensive the centralization, the greater the scaling effects that can be expected. This will make it possible to offer a homogeneous line of services. A standard portfolio that transcends all of the boundaries between national companies and holdings in the corporate group can be created.

4. Convergence of IT and NT: Software-based solutions will be used more and more frequently and will replace solutions that are hard-wired in the hardware. Basic principles from the world of IT will find ever broader utilization in the network domain. While NT and processes of proprietary systems closely related to the networks were controlled by only a few providers, IT services have developed in a highly competitive world. Flexibility and efficiency, familiar elements for IT organizations, will take their place in the NT world.

The transformation of the technology organization will extend to all functional areas

While the mobile generations 2G, 3G, and 4G were successfully established by evolutionary changes, the technologies that will be introduced in the near future will demand completely different approaches for universal connectivity and management of the network from the cloud.

The fundamental conversion of the structures is consequently the priority of the moment. All of the functional areas and tasks in the organization will be affected by this transformation. Answers must be found to key questions if this is to be accomplished:

> Organization: How must a network factory be laid out? How should delineations and lines of responsibility be drawn?

> Processes: How can new processes be described? How can the plan-build-run organizations in place today be optimized?

> Personnel: What resources will an operator require in the future? What form will work take in the future?[4]

> Corporate culture: What culture does a network provider require in a digital world? How will decisions be made in the future, and how will living leader ship be defined?

> Economic efficiency: How can economic efficiency be combined with technical performance goals?

> Partnering and alliances: What new business models will be created? What form will the interfaces to other carriers, manufacturers, and service providers take?

> Innovation and products: How can new solutions be created using services closely related to networks? How can new revenues be generated with the network?

Horizontal forms of cooperation complement vertical silos

Vertical silos represent the status quo in the organization of most network operators. Historically, tasks have been aligned along the added-value chain plan, build, run and differentiated according to subjects and functional blocks such as access fixed and mobile, aggregation, and transport.

The advantage of such an organization is the specialization and professionalization within each of the task areas. The disadvantage is that end-to-end relationships are difficult to recognize, implementation of changes and innovations is slow, and flexibility is restricted.

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[4] *Cf. Menden, Roos, Challenges for HR in the Telecommunications Industry, pp. 316 in this book.*

New IT and NT architecture principles make it possible to decouple services from the resources, to manage the network centrally, and to separate the operation of the network from the traffic. The organization must be laid out in such a way that it reflects the elements of a network architecture that will be standardized and centrally oriented in the future.

Previously separated areas will grow together. Horizontal approaches to organization will become possible. Silos can be dissolved and topics can be merged. The organization becomes leaner and more transparent. End-to-end relationships become recognizable and manageable.

The assignment of tasks to IT and NT organizations will become increasingly difficult because the functions will also blend into one another. Cloud-based networks make it possible to fuse the control over IT and NT in their operating system. The organization must follow this lead. IT and NT organizations must be tightly meshed and grow together in the future. If the organization is not adapted in this way, there is a risk that new redundancies will appear and that (for example) a second, a so-called "shadow IT", will appear in the NT world.

Moreover, governance must be revised and management must be centralized. Instead of separating managing duties into the roles of a CIO and a CTO, a merged division can be managed by a joint CTIO.

New process descriptions, methods, and tools

Besides the adaptation of the organization, a realignment of the processes will also be required. A high level of abstraction and standardization of processes will be essential to achieve the necessary degree of automation and efficiency. Otherwise, the process world of the past will simply be replaced by a new one of similar heterogeneity in which modifications will not be possible without intensive use of personnel resources and time-consuming manual interventions.

Tried and proven process frameworks such as eTOM and ITIL describe industry-specific processes or company functions. The concepts make it possible to reuse processes and prevent a situation in which they must be newly defined every single time. However, the various models have been developed for various purposes. A suitable process framework for a next generation telco network based on software is still lacking.

eTOM is used by the majority of telecommunications companies as a reference framework for business processes and has become the standard. It must be noted, however, that eTOM is in many ways a quite rigid model of little flexibility. ITIL, on the other hand, is a standard process model within the IT industry and has already been adapted to virtual architectures. The cons of ITIL are that it remains general and has not been described for specific industries. As used in telecommunications companies, ITIL addresses above all the service management processes and is found more and more in network engineering and operations departments.

If the two methods are combined with each other, however, the result is a stable framework in which the telco-specific processes of a cloud-based network operator can be mapped. This approach takes advantage of the strengths of each system and creates a practical blueprint for a new process landscape.

DevOps create end-to-end viewpoints through teamwork and the meshing of functions

The plan-build-run logic usually found in today's telcos has a critical defined breaking point: the handover of developments to their implementation in operations. Processes today traditionally run sequentially. If enterprises are to act faster and more flexibly on the market and, at the same time, reduce costs for the development of new products, the processes for development and operations must be meshed more tightly with one another. This is the task of the so-called DevOps (development and operations), a procedure that has proved its value in software development and pursues the goal of developing innovations flexibly and quickly. Intensive communication and close cooperation among the employees in development and operations make it possible to recognize and eliminate mistakes at an early stage. DevOps are successfully used at OTTs such as Facebook or Amazon, for example. This is an area where the launch of just a couple of releases every year does not suffice. Quite the contrary – innovations must be rolled out constantly. According to their own information, Facebook, for instance, is able to incorporate new features on its website without any downtime while Amazon can publish a new code every ten seconds.

While DevOps are related above all to the internal collaboration between engineering and operations, so-called Dev-for-Ops concepts aim at close cooperation between network operators and manufacturers – groups comprising employees from carriers and manufacturers and forming small teams that are jointly responsible for the life cycle of the plan-build-run chain and continuously issue new releases.[5]

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[5] *Cf. The Future Network – A Bell Labs Perspective, pp. 413.*

The meshing extends as well to the network planning because the transparency of the relationships in the network is another prerequisite for flexibility and speed. Due to the separation according to functions, mobile and fixed networks have in the past been planned separately and there is frequently only a partial view of the network. Mining the full potential of the networks and assuring end-to-end optimization requires integrated views of a network. This in turn means that integrated network planning must be established, and the planning must be supported by standard documentation and tools.[6]

A new culture as basis for the transformation

The legacy world was predictable and plannable. The (often long) decision paths and the lived culture of consensus are no longer adequate to meet the requirements of an agile future making high demands on speed and flexibility. Both employees and managers will be required to change the way they think. A new corporate culture must be instilled. That will require setting a lot of signposts. As complexity rises, the quality and quantity of the required decisions will increase significantly.

In the traditional organizations of today, decisions are made too high up in a hierarchy, at positions that are far removed from the operating business information relevant for the decisions. A large number of decision-making bodies and levels make it an easy matter to dodge accountability and leave decisions up to others. This will no longer be possible in the future. The consequences of such behavior will be bottlenecks and congestion as pending decisions pile up. Moreover, social media are democratizing the flow of information, and big data analytics provides high-quality information for decisions that must not be ignored. This is why a new culture must have as its goal the transfer of management responsibility to individual employees. The principle of subsidiarity must be introduced: tasks, actions, and problem solutions should – to the greatest possible extent – become the responsibility of individuals, the smallest groups, or the lowest level of an organizational structure. Self-responsibility is called for!

This change in the decision-making culture comes at a price that the employees must pay: reduced plannability and greater uncertainty in their actions. The reward is that the performance of employees will have significantly more substantive content and meaning. The bottom line of this approach will profit most employees – enhancing their motivation.

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[6] *Cf. Fritzsche, Schweigel, Zhao, An Effective Approach to a Solution for Integrated Planning of the Future, in: Future Telco: Profitability in der Telecommunications Industry, Detecon Publication, 2014, pp. 116.*

This development will also force managers to change how they think. They must let go of their desire for control and stop defining themselves in terms of power, influence, and size of their departments. The future task of management will be much more oriented to creation of a framework in which employees can develop their potential. Simultaneously, managers must grasp the reduction of operational decisions and putting trust in their employees as an opportunity because this is the only way to reduce the costs of consultation and coordination that are still very high today. Instead of spending the greater part of their time in coordination meetings, managers will gain the time to lead their employees and to work on the content of business subjects. The number of coordination and cooperation programs in the organization can be cut back.

More economic efficiency thinking in technology

Technology organizations are frequently oriented to the achievement of technical performance targets. The simultaneous achievement of economic efficiency is a discipline that most engineers know little about. As a consequence, there is frequently extensive potential for economic efficiency in technology organizations. If this potential is to be exploited, it is necessary to establish mechanisms that can generate cost transparency and enable the specific management of economic efficiency.

One procedure that is suitable for achieving an economic optimum is the design-to-cost and -value method that seeks the most efficient design. In today's world, any budget that has been allocated for a project will, as a rule, be consumed fully in the achievement of a technologically ideal solution. There are no incentives to cut costs. Application of the design-to-cost approach leads to systematic consideration of whether the results defined in the specifications could not be realized at a lower cost (design-to-cost) or whether the value of a solution cannot be increased while complying with the allocated costs (design-to-value). The subject of the optimization of the costs and value is a "total cost of ownership" (TCO) assessment. All of the cost drivers along an end-to-end chain, including elements such as software, hardware, process costs, and personnel, are analyzed. Design-to-cost finds application above all in engineering because the levers have their greatest impact in an early phase of design. The rigorous application of design-to-cost can at the same time lead to a change in the way of thinking and enhance the strictly technological performance dimension with thinking in terms of economic efficiency.

Target costing also aims to secure economic efficiency during creation of the performance. This method systematically determines the target costs. The maximum costs allowed are calculated on the basis of the expected revenues and planned margin, which are contrasted bottom-up with the calculated costs by the use of benchmarks. The process concludes with the ex ante definition of the target costs permitted for an action, and they are closely monitored during the realization. If deviations occur, suitable measures such as design-to-cost are initiated. This method ensures that costs are recognized at an early stage and can be managed specifically. There is less need for retroactive corrections.

Telefónica offers one example of how efficiency can consistently be realized by the introduction of a new technology. The introduction of NFV/SDN, the co-called UNICA project, is continuously accompanied by TCO analyses. The conscious decision was made to orient the transformation to the goal of the greatest possible economic efficiency and not to the goal of the best possible service performance at the customer interface.[7]

Software-based networks for new business models – and new interfaces

The introduction of virtualization and all-encompassing connectivity will change the relationships of the operators to their outer edges. A redefinition of the relationships to other network operators as well as to vendors is needed. The added-value chain must be questioned, and organization and process design must take this into account.

The scaling effects in an ecosystem in which the network is virtually mapped and managed from a central position are all the greater when the use of network capacity is further optimized by joint utilization. The creation of the largest possible networks through cooperative activities is the logical step for making the most of the scaling advantages.

This will result in new business models for cooperation among network operators. Models of international alliances such as those that have long since become common in the aviation industry can be transferred to the world of telecommunications. One example of this is the Pan-Net of Deutsche Telekom, where a crossover production model for the individual national companies in the Telekom Group is realized.[8]

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[7] *Cf. OVUM, Becoming an Agile Telco: Telefonica's plans for NFV, 12/2015.*

[8] *Cf. Günther, Hischke, Meissner, A New Perspective on Cross Country Synergies, pp. 206 in this book.*

Another example is the Next Generation Enterprise Network Alliance (Ngena), a global alliance of telecommunications providers founded in the spring of 2016. Ngena offers telecommunications services such as VPN access or WAN connectivity of locations to international business customers requiring communications across national borders. A joint production platform is established in an independent company and links the transport resources of its members in a cloud so that various national access services can be used. The founding members are CenturyLink, Deutsche Telekom, Reliance, and SK Telecom. Another 20 network operators are expected to join.[9]

The technology organization as the driver for innovations and the source of new revenues

"Network Is King"[10] is all the truer the more the network realizes the connectivity of all devices in an IoT and 5G world and manages it from a cloud. The new technologies enable telcos to develop and market customer-centric network solutions that provide sustainable unique selling propositions in competitive environments, particularly with respect to OTTs.

Today, customers adapt to the network. By and large, standard best-effort services are produced; they are not differentiated and do not guarantee quality. In the future, the network will adapt to the customers and offer them tailored solutions that are infinitely scalable and can be provided within a very short time.

This opens up a great opportunity for the network to become the driver for differentiation in competition and no longer to be the bottleneck for innovations. The "technologists" in the network operator's organization will put a new, powerful tool into the hands of product managers. The network will no longer be the recipient of demands that must be realized; it can emancipate itself as the driver of innovation and open up new revenue potential. The innovation management of a 5G/SDN network factory makes it possible to work according to the principle of "fail fast, fail cheap". A large number of new products can be rolled out within a brief period of time, and customers decide themselves which of the innovations they want to accept. A high percentage of flops is deliberately accepted because the expenditures for development and rollout are very low. The high degree of automation and centralization makes this possible.

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[9] *Cf. http://www.ngena.net/.*

[10] *Cf. Krüssel, Network is King!, in Future Telco – Profitability in the Telecommunications Industry: Seven Levers Securing the Future, 2014, pp 8.*

One important new element in the product portfolio of a carrier is network slicing. This concept has been incorporated into the 5G architecture. The future networks will be built in such a way that specific network resources and/or functions are assigned to users according to their particular needs over a defined period of time. The parameters that can be defined will be selected from a service catalog that determines the duration, quantity, and quality of the services. Features such as latency times, bandwidths, security requirements, and voice quality are examples of features that can be defined. However, service-related features can also be built into the "network slice" such as the telephony exchange function (PBX) or supplementary services such as billing, invoicing, or CRM.

A "slice" of the network of this nature can be provided (for example) to an energy provider who requires extremely high security against failure and attacks in the connectivity of its "smart grids" for the management of a high-voltage grid, but is perfectly content with very low bandwidth. Or the network is specially configured for Connected Car applications, enabling autonomous driving or other applications. In this case, the major points of the demands will be very fast response times through low latency and fast connection times.

Other innovative services that make network-specific properties their own are products that build on the platform of the new IP multimedia subsystem (IMS). The production of voice over the IP protocol is based on IMS platforms in fixed (VoIP) and mobile (VoLTE) networks. If this is expanded by the addition of a rich communication suite (RCS), completely new opportunities for services and open interfaces (API) for partners become available. RCS-based services have the advantage that native RCS clients will be included in future devices – customers will not need to install separate apps. The applications will automatically be made available to the customers by the network, and a great mass of customers will be reachable from the very beginning. Quality can be guaranteed for the entire E2E connection.[11]

Transformation of the technology organization of network operators – a road map

The high dynamics of developments make it impossible to describe the goals that should be achieved with the transformation in more than vague terms. So it is all the more important to have guide rails on the road to the goal. Corridors for a transformation must be defined, and they must make it possible to determine whether the transformation program is still following the charted course. Guide rails in this sense are measurable variables such as process running times (definition of the time from the idea to the launch), the number of processes that should be reduced, or financial KPIs (savings targets).

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[11] *Cf. Goertz, Kuhn, "Network-Enabled Services – IMS-Based Services Create New Business Opportunities Across All Industries", in Future Telco Reloaded, Detecon Publication, Strategien für eine erfolgreiche Positionierung im Wettbewerb, 2015, pp. 120.*

At the same time, there should be a definition of what should not be done any longer in the future. Examples of such "stop doing" measures: "Stop operating anything that is not IP" or "Do not develop any further legacy OSS/BSS." The exclusion of topics helps to focus resources on new tasks. "Stop doing" and "Let go" are disciplines that must be newly learned, particularly by established network operators.

The path into the future involves finding the right balance between "brownfield" approaches aimed at the modification of existing structures and "greenfield" measures offering a framework for the creation of new organizations on the green meadow. The side-by-side conduct of tried and proven, traditional legacy business and of the new business focusing on digitalization and a 5G/SDN network must be balanced. Telecommunications providers are moving along different routes here, from the creation of their own independent business units for digital business to the establishment of separate legal entities.

The imminent transformation of the technology organizations is extensive – indeed, it may be the greatest upheaval ever in the history of network operators. The change in the culture and the DNA of the companies will require stamina and sound judgment. Finding the right balance between stability in fundamental principles and flexibility in goals and business models will be decisive.

A program that sets the right tempo and provides a 360° analysis must be initiated in good time. And that is worth the effort! Once the goal has been reached, once operators have arrived in the new world with a network architecture in which customer-specific 5G and IoT solutions from the cloud can be offered, they will have carved out a position for themselves on the market that competitors will not be able to copy so quickly. That is the guarantee for long-term success.

■

Challenges for HR in the Telecommunications Industry: Competence Transformation Follows Market Change

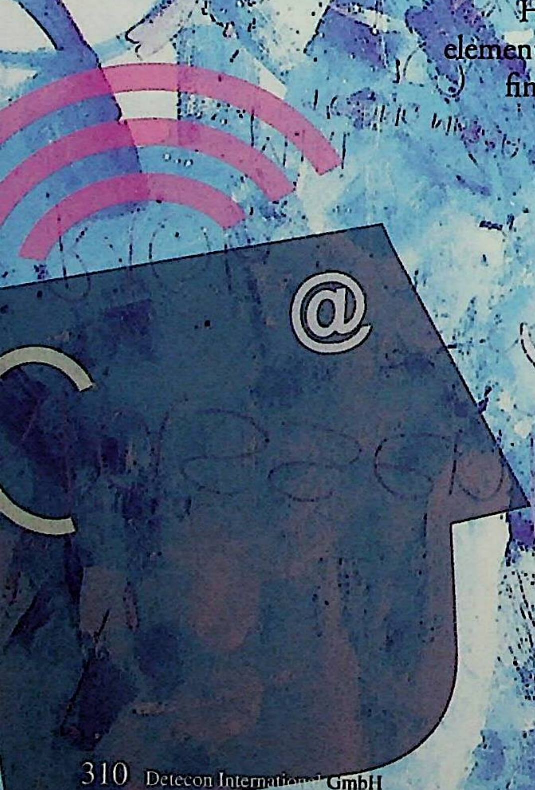
Björn Menden, Steffen Roos

- The changes on the market will have far-reaching consequences for carriers. The shift in roles and skills within the organization represents one of the greatest challenges.

- HR is itself caught up in a transformation process, but it is simultaneously a driver of transformation in the company.

- Within the framework of this transformation, the HR department must view itself as an integral element that collaborates with the "business side" to find solutions for the customers on the market.

- A carefully considered and holistic talent strategy is the key to the solution.



Anyone speaking about the future of telecommunications must take care not to forget about the people working in the telecommunications industry. Even today, one of the key questions for carriers revolves around what employees will perform what tasks in the near future, what future skills will be required – and what skills will not be needed.

The innovation and transformation process on the ICT market requires a corresponding, ongoing update of the role and skills portfolio. The changes are complex and simultaneously fast and furious; the required skills are in some cases highly specific, rare, and very difficult to find; many of the details in the shaping of the new roles are often unforeseeable. All of these factors make the shift in roles and skills one of the greatest challenges confronting carriers, and it must be managed actively and mastered.

Elementary changes on the telecommunications market

The drivers of change on the telecommunications market are numerous and varied, and their simultaneous occurrence generates a "storm of transformation" for carriers. We regard the following factors (besides the drivers resulting from the current competitive position of the telcos) to be of the greatest relevance for our deliberations:

> Telecommunications companies are following internationalization strategies as a means of expanding their presence as well as of providing cross-border solutions in contexts such as machine-to-machine and Internet of Things. English skills are becoming increasingly important.

> Customer expectations and customer interfaces are changing; digital channels and social media are growing in significance. But "brick and mortar stores" are experiencing their own renaissance by introducing new, fresh concepts. Operators must employ a multichannel approach to develop into genuine omnichannel companies, overcome channel egoism, and address and serve customers coherently at many different touch points.

> The convergence of mobile and fixed ICT continues to advance, making it possible to offer significantly more complex solutions and new services while at the same time exploiting efficiency effects in the long term.

> The fundamental change of the technology in Next Generation Networks will open the door to new services and customer offers in the shift of the operators' business model toward data services, from telephone providers to data trans-

port companies. In addition, completely new, centralized network operations will appear as part of the all-IP conversion of the networks. At the same time, the network standards developed by IT will mean increasing relevance of the software with respect to hardware. Telecommunications is going through a process of wide-area "softwareization".

> Products, services, and entire business models built on data can be modified and adapted very rapidly. Comprehensive analyses permit ad-hoc and real-time responses. Micro services for special and specific target groups can theoretically be realized very simply and quickly; management decisions are backed up more strongly with data material. Telecommunications companies are becoming "big data-driven companies".

> Thanks to the increase in data quantities, touch points, and interactions with customers, trust will become a core element of an operator's brand. Data security and data protection are inseparably integrated into the DNA of a successful telecommunications company.

> The automation rate of processes and repetitive activities will increase substantially in the telecommunications industry. This can lead to a lessening of the burdens on the workforce and free up the resources for creative, innovative activities.

> Last, but not least, the technical opportunities for support of virtual collaboration and digital information management will continue to develop enormously. Modern digital working environments will enable much tighter networking of spatially separated, cross-functional, and subject-oriented teams, cooperation across physical boundaries, and collaboration on projects. Managers will be called upon to lead teams whose members are at different physical locations. Orientation to results and performance culture based on trust will of necessity gradually replace the previous "command and control" leadership style.

The consequences from the changes in the business models, the new working world, and the leaps forward in technology also found in the telecommunications sector (and especially here) are far-reaching.

PARADIGM CHANGE

The movement in the direction of all-IP networks and software solutions that more and more are replacing the traditional infrastructure using dedicated telecommunications hardware stands for more than just a change in the technical infrastructure; it is actually representative for a fundamental paradigm change in the telecommunications industry. It is certainly legitimate to ask whether the occupational profile of the telecommunications engineer actually has a viable future and whether it would not be more advisable to seek training in the IT field as the basis for a career on the technical side of the telecommunications business.

An especially important objective must be to transform the basic know-how about voice and data operations as well as switching and routing from hardware-oriented network planning into IT management expertise. Telecommunications engineers must have the ability "to simulate" with software (on standard hardware) the underlying processes of the telecommunications industry and to translate specifications for network hardware step by step into requirements for software companies or for their own developments.

Table: Changes in Business and Resulting Changes in Skills Requirements

	Past:	*Future:*
Business Demand	• Telecommunications technology and hardware as a basis for the business model • Non-specific mass business • Mastery of mass processes • Securing of basic service • Presence culture and command and control leadership	• Services as a competitive factor • Micro-segmented target groups/ mass customizing • Flexible process and service design • Partner management • Customer service as a competitive factor
Skill Requirements	• Technology affinity with in-depth, detailed specialist knowledge • Reliable execution	• Customer and service orientation • Performance flexibility • Creativity for high innovation rate • Willingness to learn, development of personality • Project management • Self-determination of daily business

Source: Detecon

What does this now mean for established telecommunications companies, for the incumbents on the saturated markets in Europe, America, or Asia? Obviously dramatic changes of this scope must lead to adaptations in the organization. HR must (within the framework of this transformation) develop a fundamental and solid understanding of the technological changes that are taking place and the impact they will have.

New roles and patience in the transformation

If telecommunications companies are to meet the changed demands related to technology, market, and business strategy, they will have to do more than just think about new skills. They will have to go far beyond this and describe and implement new roles. The organization of the future will be much more strongly project-driven, more flexible, networked, and fluid than the line organizations currently in place. Expert roles with specialized and specific know-how will be handling assignments in various fields and different projects. Projects and activities will become increasingly international, foreign language skills and intercultural cooperation will increase in significance. Knowledge of project and program management as well as IT skills will become more essential. Obviously the transformation will not sweep the old world away with a single stroke. There is still a long road ahead until the legacy world in ICT systems, processes, procedural models, and organization has been set aside. Telecommunications companies suffer intensely from the complexity arising from over-adapted ICT systems, overloaded processes, restrictive requirements, rigid line organizations, silo thinking, and departmental egoism, and they have no one to blame for this but themselves. This legacy world will be subjected to increasing efficiency pressures while the new world is still in the parallel construction phase.

But what are the key roles that must be filled as the first priority? Transformation is demanding changes in all positions, but three areas will be highlighted here as representative of all.

Chief Digital Officer (CDO): Current discussion consistently points to one key role critical for success that must urgently be filled with a highly competent candidate: the chief digital officer. CDOs will be expected to use their central position to drive the organization's digital transformation and move it forward. But what is the instrument set of CDOs? Where are they anchored? Are they a part of top management, or do they report to the CIOs? What muscle power will be given to CDOs so that they can achieve their goals and overcome resistance?

We are convinced that ideal CDOs must be brought in from outside the organization and must, if at all possible, be a member of top management. Moreover, they need these important traits: they must be committed drivers of digitalization and, in this sense, be drivers of transformation, networkers in their ideas and actions, motivators of the organization, able to convince and carry employees and management alike with them; and they must feel beholden to the rollout of a new, digital operating system for the company.

Data Managers: As the significance of data in the telecommunications business model continues to grow, the roles related to the management of data will become more relevant as well. Among such roles are the profiles that take care of the collection, analysis, stewardship, security, and protection of data as well as product developers who generate services and products from data. A carrier is well advised to develop fully and fill the role of chief data officer. Finding candidates on the outside market to fill any of the roles revolving around data management is difficult even today. Major efforts will be required additionally in the areas of training and ongoing training of employees and their further training and qualification in these roles.

Solution Architects: Telecommunications companies have little to no positive tradition in the management of software development. The BSS/OSS landscape currently found at almost all carriers is a sad testimonial to over-adaptation, a lack of standardization, inadequate documentation, and poor interface and data management. In the future, software will play a significantly greater role than it does even today in networks, interaction with partners and OTTs, and at the customer interface. That is why it will be necessary to develop capable solution architects who – with end-to-end responsibility – design, coordinate, and implement complex solutions at the interface between the business side, IT, technology, and external service providers. In addition, this role will have the task of defining, rolling out, and continuously evolving documentation and development standards. This role will continue to grow in relevance for business and success in view of the greater impact of software in critical areas.

Consequences and recommendations for HR

As a rule, there are a number of consequences whose management will present a massive, but solvable challenge.

The first consequence is the necessity to transform the skills and capabilities of the workforce. Both technological transformation and the rising pressure for greater efficiency will leave companies no other choice. The second consequence is the achievement of flexibility and agility such as found among OTT players. Carriers are facing the question of how and where they can utilize as well as develop these capabilities. How do you combine agile product development with efficiency-oriented production? What strategy should be pursued in dealing with the OTT players, and what competencies are required to accomplish this?

HR departments and strategists in many companies are struggling with the question of what future competence models in their business will look like – and in some cases, even what the business itself will look like. Although it is possible to discern the development of strategy patterns, many telecommunications companies are still uncertain about the business models they want to follow as they steer their operations into the future.

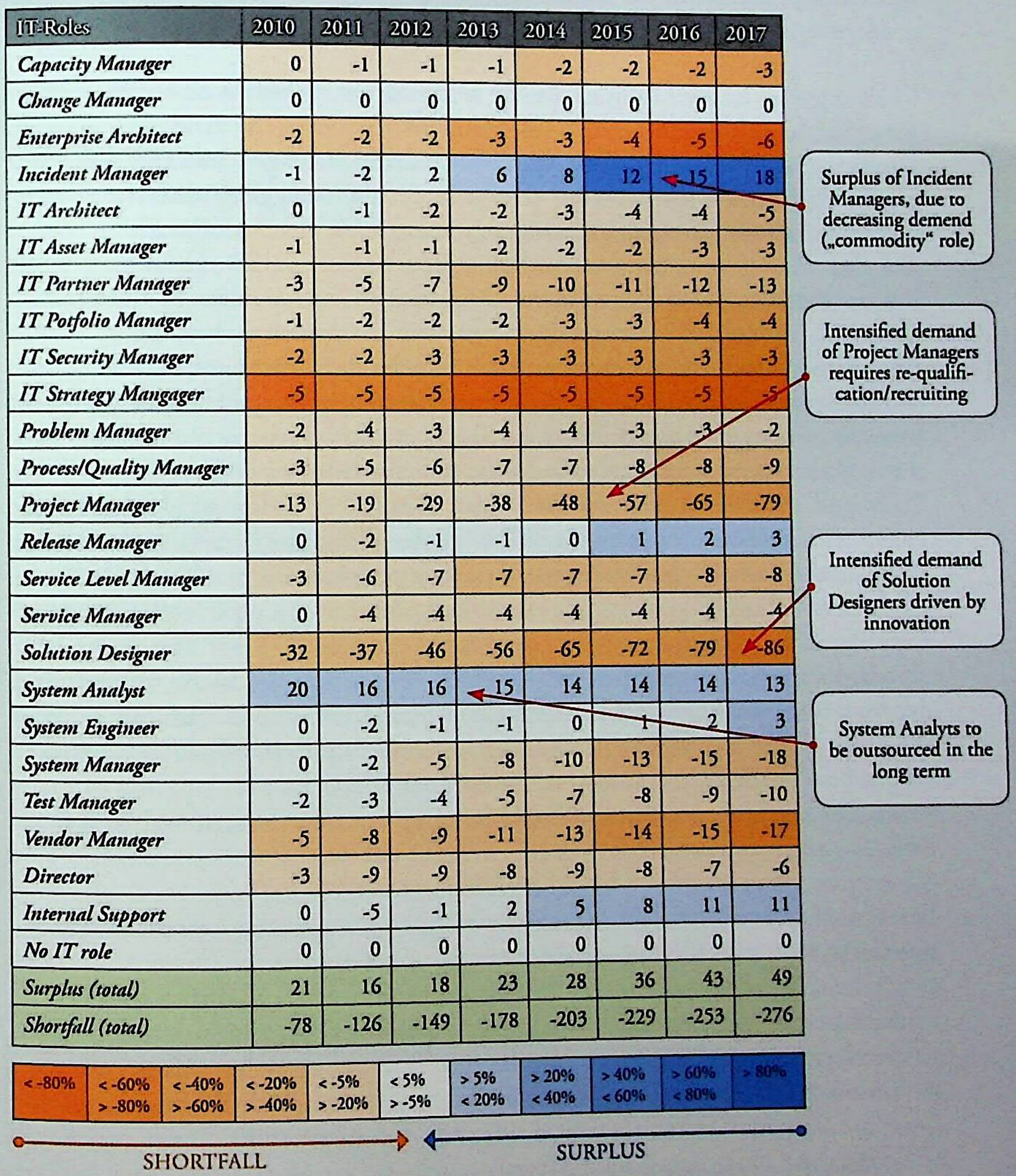
In this article, we take a look at workforce management as well as employment or transfer units as possible instruments to guide and shape this transformation. Both of these instruments can develop enormous leverage within the framework of a massive transformation. They are not, however, the only instruments, but merely an excerpt from the complete portfolio.

Workforce Management: As a concept, total workforce management is nothing new. There are challenges and opportunities inherent in this area because of digitalization that have never previously appeared in this form. Generally peaking, total workforce management means the assumption by the HR department of a significantly more analytical approach to personnel planning and management that goes beyond the HR department to encompass the personnel management tasks of each and every executive. Analysis, skills matching, development planning, filling of positions in the line, and the provision of capacities for projects will turn more and more into real-time tasks that can no longer be pressed into the mold of annual planning cycles. At the same time, however, planning and development of the concept portfolio demand a long-term view in harmony with strategy that attempts to predict supply and demand so that this important basis for business can be actively shaped with the appropriate HR instruments.

This gives rise in turn to further demands on subjects such as performance management, skills management, training, and advanced development. New learning methods are necessary so that the changes in skills and capabilities in the workforce can be mapped – including training catalogs that are not based on traditional courses. There will be more advanced development on the job itself, but it will by no means be arbitrary; it will be directed by the appropriate platforms and through the use of technology.

The composition of the workforce will change. A broad range of software solutions in the area of skills management and skills matching will appear, and they will serve as the basis for generating optimal staffing for projects in alignment with profiles – including projections for project success and critical points

Figure 1: Example of Workforce Management



IT-Roles	2010	2011	2012	2013	2014	2015	2016	2017
Capacity Manager	0	-1	-1	-1	-2	-2	-2	-3
Change Manager	0	0	0	0	0	0	0	0
Enterprise Architect	-2	-2	-2	-3	-3	-4	-5	-6
Incident Manager	-1	-2	2	6	8	12	15	18
IT Architect	0	-1	-2	-2	-3	-4	-4	-5
IT Asset Manager	-1	-1	-1	-2	-2	-2	-3	-3
IT Partner Manager	-3	-5	-7	-9	-10	-11	-12	-13
IT Potfolio Manager	-1	-2	-2	-2	-3	-3	-4	-4
IT Security Manager	-2	-2	-3	-3	-3	-3	-3	-3
IT Strategy Mangager	-5	-5	-5	-5	-5	-5	-5	-5
Problem Manager	-2	-4	-3	-4	-4	-3	-3	-2
Process/Quality Manager	-3	-5	-6	-7	-7	-8	-8	-9
Project Manager	-13	-19	-29	-38	-48	-57	-65	-79
Release Manager	0	-2	-1	-1	0	1	2	3
Service Level Manager	-3	-6	-7	-7	-7	-7	-8	-8
Service Manager	0	-4	-4	-4	-4	-4	-4	-4
Solution Designer	-32	-37	-46	-56	-65	-72	-79	-86
System Analyst	20	16	16	15	14	14	14	13
System Engineer	0	-2	-1	-1	0	1	2	3
System Manager	0	-2	-5	-8	-10	-13	-15	-18
Test Manager	-2	-3	-4	-5	-7	-8	-9	-10
Vendor Manager	-5	-8	-9	-11	-13	-14	-15	-17
Director	-3	-9	-9	-8	-9	-8	-7	-6
Internal Support	0	-5	-1	2	5	8	11	11
No IT role	0	0	0	0	0	0	0	0
Surplus (total)	21	16	18	23	28	36	43	49
Shortfall (total)	-78	-126	-149	-178	-203	-229	-253	-276

Surplus of Incident Managers, due to decreasing demend („commodity" role)

Intensified demand of Project Managers requires re-qualification/recruiting

Intensified demand of Solution Designers driven by innovation

System Analyts to be outsourced in the long term

< -80%	< -60% > -80%	< -40% > -60%	< -20% > -40%	< -5% > -20%	< 5% > -5%	> 5% < 20%	> 20% < 40%	> 40% < 60%	> 60% < 80%	> 80%

Source: Detecon

in various scenarios of personnel assignments and staffing. This is certainly not a new problem. The fact, however, that there will more and more frequently be a mixture of regular workforce and personnel acquired for a specific project indicates that there will be quite a fundamental change in the working world. The issue here concerns highly qualified specialists who are in demand on the market as well as any number of activities that can be handled at lower cost in this way. The setting is always that HR must assure and develop further the availability of certain core skills.

The subject of leadership must also be reconsidered. What do all of these topics mean for the demands on executives in this environment? The various dimensions – some of which contradict one another – must be managed, and this must take place in a situation in which the executives are also struggling with the changes in demands made on them and with a growing sense of uncertainty.*

Employment and transfer companies

Employment and transfer companies are vehicles in competence transformation to the extent that deliberations go beyond the simple outsourcing of personnel who are no longer required. The mechanism employed here is the removal from the organization of personnel who do not have the required skills and capabilities. Skills and capabilities that are no longer required in the original added-value chain are eliminated, opening up the space for optimization of the added-value chain analogously to the challenges of the competition that is strongly driven by efficiency.

Two aspects are important in this context: one is that the block of personnel expenses that puts pressure on competitiveness must not be reduced to zero; the other is that a company has a social responsibility to its employees, many of whom have made contributions to the company's success over a period of many years. This social responsibility should be given consideration in each and every case.

Features of an employment and transfer company as a central instrument for the transformation of skills and capabilities:

> Assessment of existing skills and capabilities and the evaluation of development possibilities;
> Training and advanced training;

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* *Cf. Menden/Pandey, Leadership in a Digitalized World, DMR 1/2016, pp. 4–7.*

> Support of the access to the outside labor market or outplacement;
> Creation of an internal labor market;
> Supporting and consulting function related to measures effective for employment in the company or the corporate group.

Depending on the size of the transfer unit, a decision must be made whether a consulting institution can be set up within the HR department or whether it would be better to view it as a separate unit with its own business purposes.

HR organization as driver

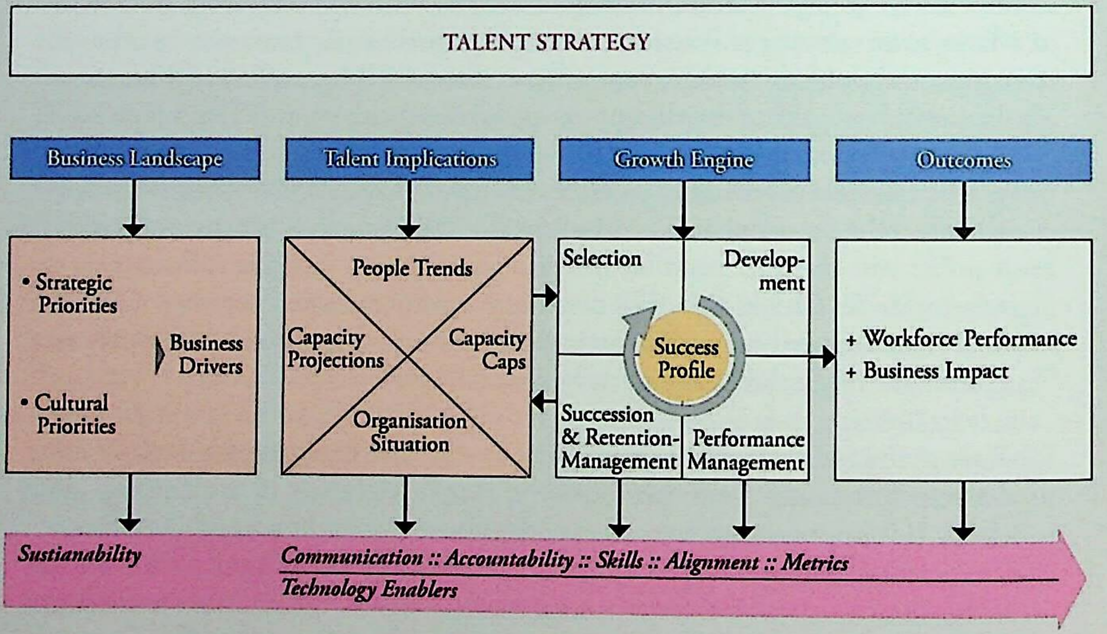
But who will drive these changes forward in the organization? We are convinced that, when it comes to changes, it is absolutely mandatory – especially for larger telecommunications companies – to take advantage of the HR function as a decisive driver for digital transformation and the new business models. HR will then be able to make use of the appropriate instruments as described above not merely to guide, but actively to steer the comprehensive changes in the requirements for skills and capabilities of the organization and its employees. In this sense, the role of HR will also undergo a transformation and must take its leave of administrative support. Virtualization and digitalization must not be allowed to stop at the door to the HR department – above all because it will be virtually impossible to realize anything in the overall organization if HR keeps itself aloof from the same processes. More than ever before, HR will be required to integrate its services more tightly into the company's business. Only if this is understood, only if the department thinks holistically and focuses on the customer as the focal point will the HR position be able to exercise a decisive influence in a digital world. To achieve this, HR must replace the internal customer with the external customer and see itself as an integral element that works jointly with the "business side" to find solutions that benefit customers.

We have examined only two instruments or fields here that can play a major role in the transformation. They are, however, simply elements in a changing HR portfolio. It is important to have an overall philosophy in the area of competence and, in no small degree, talent management that the HR department must use to meet this massive transformation in requirements head-on. True, the technology aspect is very much at the forefront because of its significance for efficiency and successful business models. The most critical resource, however, is people; they must be capable of implementing technologies in organizations, processes, or business models. Employees who are able to do this are in demand – and not only by telecommunications companies, but also by attractive OTT players, startups, or the automotive industry in the segments Connected Car and Mobility Platforms.

A well-considered talent strategy is consequently the key to the solution for the HR department. This talent strategy should be viewed as more than just the fostering of high potentials; it is a holistic approach that can be broken down to the general skills and workforce management.

One must not forget that the HR department is asking the same questions as the rest of the company. Where can we find the skills and capabilities needed to prepare our employees digitally and to ensure that they can meet the new demands? And what is to be done with the skills and capabilities that we no longer need?

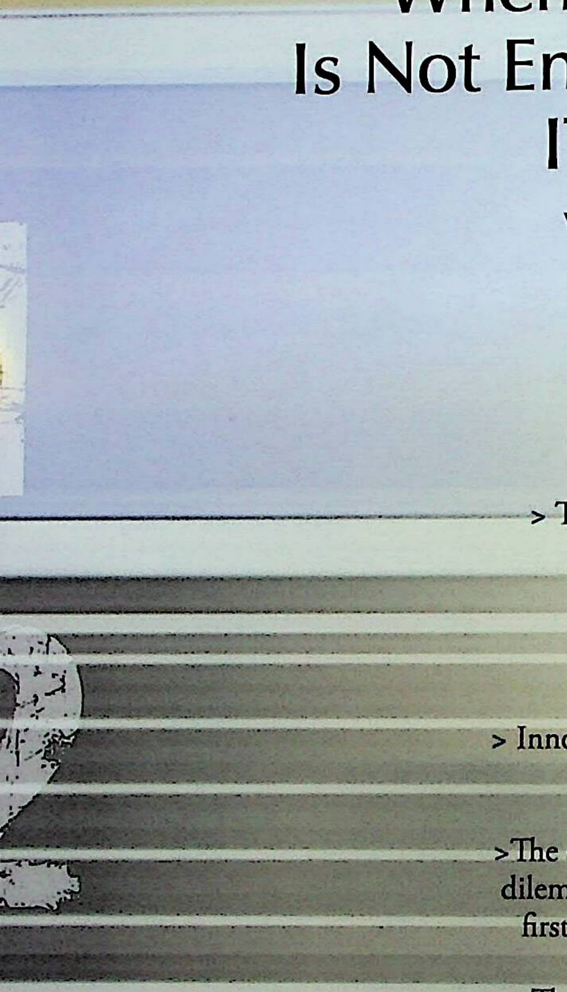
Figure 2: Talent Strategy


TALENT STRATEGY
Business Landscape
Talent Implications
Growth Engine
Outcomes
• Strategic Priorities
Business Drivers
• Cultural Priorities
People Trends
Capacity Projections
Capacity Caps
Organisation Situation
Selection
Development
Success Profile
Succession & Retention-Management
Performance Management
+ Workforce Performance
+ Business Impact
Sustianability
Communication :: Accountability :: Skills :: Alignment :: Metrics
Technology Enablers

Source: Detecon

When Cleaning House Is Not Enough: Mastering IT Transformation with Two Speeds

Johannes Ewers



> The growing complexity of an IT landscape driven by technical debt can no longer be controlled adequately and at reasonable cost using the traditional means of refactoring or modernization.

> Innovations are blocked because changes in IT become exponentially more expensive.

>The strategy of "two speeds" is a way out of the dilemma; although it appears to be a paradox at first glance, it represents a genuine alternative.

>The strict avoidance of technical debt ensures success in the long run.

If you ask the CIO of a telecommunications company about his plans at the beginning of the year, he will take a stand as the partner of the product managers and talk to you about innovations. If you ask him about results at the end of the year, he will frequently have to admit that many of the innovations got left behind and that a lot of time was spent keeping the current IT landscape alive. What is the cause of this discrepancy? And how can the innovation rate be improved?

Complexity is the decisive risk

It will come as no surprise to hear that one major cause is to be found in the complexity of the IT landscape. Characteristics of complexity are the scope of the functions, the number of subsystems, the number of interfaces between subsystems and to the environment, or the number of data objects. All of these components have interdependencies. A change at one point can have an impact on many other components.

In contrast to simple systems, where there is a clearly discernible cause and effect relationship when changes are made, complex systems are characterized by a lack of complete understanding of the cause and effect relationships. Another characteristic is that hidden interdependencies in the system modules cannot be adequately identified and documented even by extensive analyses. The risk that even small changes will have enormous negative consequences is very high. The expenditures for planning and testing subsequent to changes being made in the system grow exponentially.

Technical debt is at the heart of transformation risks

No CIO consciously strives to make his IT landscape unnecessarily complex. Everyone wants to be "lean" and successfully make use of "out-of-the-box" functions. Yet complexity continues to grow inexorably. One of the causes for this is the way "technical debt" is handled.[1]

Just like any other complex undertakings, IT projects are marked by the interdependencies between quality, time, and costs of the results. The greatest pressure on the results frequently comes from competition and from the product management, who would like to put the new products and skills on the market. It goes without saying that the resources available to achieve this are limited, resulting in a lame compromise in the quality of the solution. These shortcuts in quality are frequently not recognizable in the short term; they do not become apparent until further down the road. This can happen because developers always have alternatives when implementing functions and changes. They can go with fast and questionable solutions that will make further changes in the future even more complicated or they can implement well-designed solutions that take up more time in the immediate future, but in the long term can be more effectively maintained. In most cases, the first strategy becomes the method of choice as a way to escape the time pressure. The result in the IT system is a situation that can be compared with debt on a bank account. When the next change comes along, it costs more time and money to reduce the technical debt. In reality, however, the technical debt accumulates further. Every change is under time pressure, and programmers attempt to arrive at a result by resorting to implementation tricks. The technical debt rises and rises. The first symptoms appear when a release upgrade in the basic software is no longer possible. The day when the debt has to be repaid is inevitable.

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[1] *Technical debt is the accumulation of defects, quality issues (such as difficult to read code or low data quality), poor architecture, and poor design in existing solutions," the definition as worded by Ward Cunningham, who also developed the first "wiki".*

Complexity drives project costs exponentially

Every company that has fallen into the trap of technical debt decides at some point to do a thorough housecleaning. Complexity strikes again.

Complexity drives the size of IT projects. A large number of team members is required to carry out a major IT project. They must all have the information necessary for their work and communicate with one another. Communication takes time, reducing productivity. The larger the team, the lower the level of roductivity for each team member will be. One rule of thumb states: If the number of team members is doubled, productivity increases only by about $\sqrt{2}$. The rest is consumed by the internal communication. This is an effect that leads to Brooks' Law: "Adding manpower to a late software project makes it later."[2] Figure 1 illustrates the effect for large projects (upper curve).

The number of team members rises exponentially, the degree to which output increases becomes smaller and smaller. Although an exaggeration, we can say this: projects with very high levels of complexity can no longer be carried out economically. What to do?

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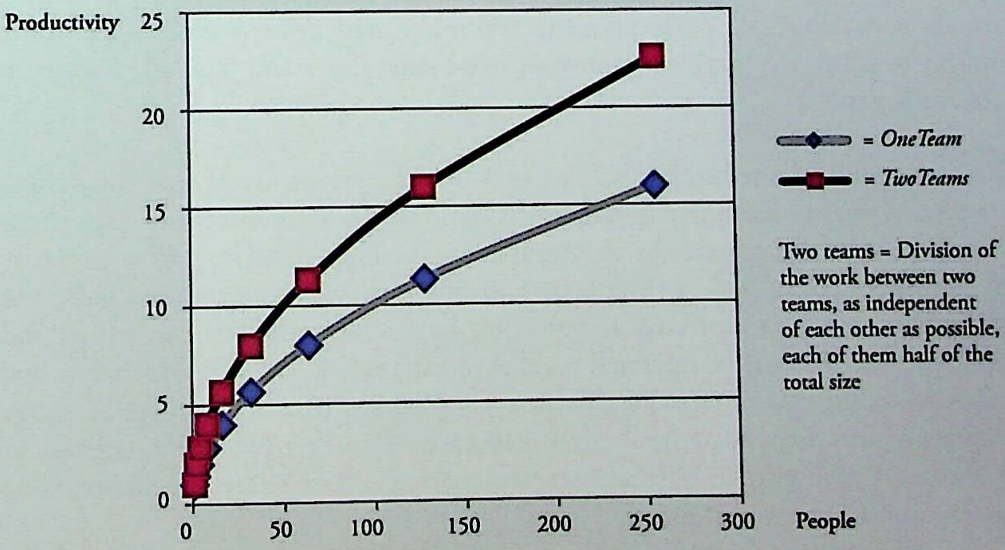
[2] *Brooks' Law, "Adding manpower to a late software project makes it later," refers to a well-known software engineering principle proposed by Frederick P. Brooks in his famous book, "The Mythical Man-Month".*

Refactoring: Cleaning house in the IT landscape

The most obvious solution is this: clean house! Or to put it another way: pay back the technical debt before installing any innovations. The point is to simplify the system and make it leaner without cutting back on its functionality. The ultimate objective is to reduce substantially the future expenditures of time and money for functional expansions and searches for errors. There are many different measures to accomplish this:

> At the system level: redundant systems are consolidated, superfluous components are turned off, and business processes are migrated to the consolidated components.
> At the code level: the readability, understandability, maintainability, and expandability of source texts are improved by manual or automated structural improvements.
> At the information level: documents are updated to the latest version, formalized, and visually improved so that the instruction of new developers is accelerated.

Figure 1: Relationship Between Complexity and Productivity



Source: Detecon

Risks during refactoring are often reduced by applying it solely to functioning systems and modules so that all of the functionalities are maintained. Undesired changes and errors must be avoided.

Changes are realized gradually so that control over the quality of the results is maintained. If only slight changes are made, the risk of making mistakes during refactoring is reduced and/or there is a greater chance of correcting new errors faster. The functionality and integrity of the system must be tested by the conduct of regression tests after every refactoring step.

It will quickly become obvious that refactoring takes a lot of time if risks are to be minimized and the ultimate goal is long-term improvement. The repayment of technical debt is a major effort. The longer you wait, the greater the complexity and the higher the interest on the debt will be.

Refactoring and the implementation of new functionalities do not make good bedfellows. In extreme cases, a platform has to be frozen for several years while the clutter.

Modernization: replacing components

If something can't be repaired, it has to be replaced. Manufacturers are constantly extolling new solutions and releases of their products. If the CRM or billing system is no longer up to the challenges facing it, why not replace it? This would appear to be an alternative if you want to become faster and have the budget to cover the expense.

But technical debt is lurking here as well. It is highly probable that the system scheduled for replacement is entangled in a network of interfaces and interdependencies. The greater the technical debt, the higher the level of complexity of the interfaces as well. In the course of modernization, complexity will even increase because the operational transition to the new solution takes time and the two systems must be operated parallel to each other. The consequence is that many of the interfaces must be doubled – a situation that, when there is a large number of interdependencies, is almost beyond anyone's capability to control, as is illustrated in Figure 2. Greater complexity leads in turn to exponentially rising expenditures of time and money.

Implanting a new solution in this network without endangering integrity is virtually impossible.

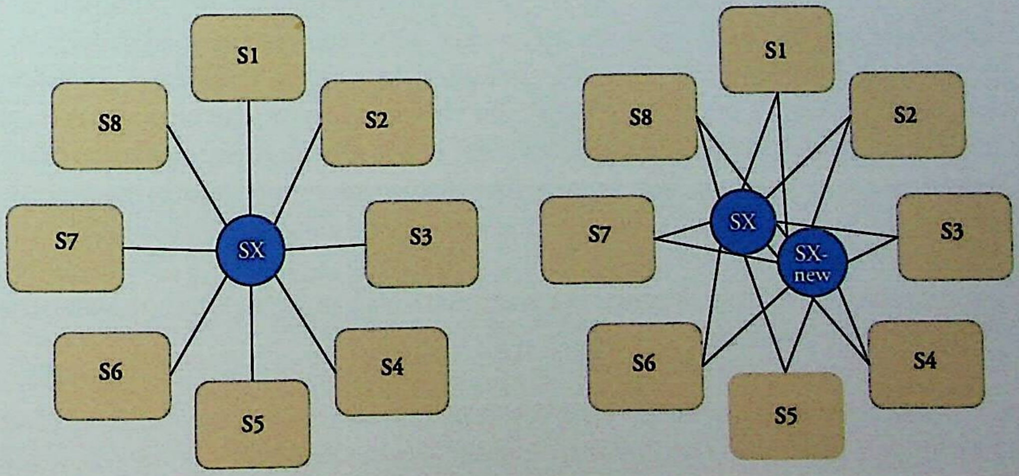
Divide et impera: divide and conquer

When a housecleaning is not enough to get the job done and modernization entails too many risks, new strategies must be found. At this point, the ancient strategy of "divide and conquer" (Machiavelli or Louis XI of France) serves as a signpost. If we are able to divide the complexity of the IT system into relatively independent areas, the transformation team can also be divided into groups that communicate primarily within these smaller groups and only to a limited extent between groups. When new people, developers, and testers are added to groups, the √2 rule still applies within the group. But as the lower curve in Figure 1 shows, the effect does not appear until much later and makes greater productivity possible. The true test of skill is in the clever separation of system areas and the minimization of the communication among the areas.

There are tested examples in IT that clearly illustrate the effect of the separation:

> Separation between infrastructure (servers, storage, LAN) and applications: separate departments or teams take care of the two areas. The infrastructure team provides a defined service with agreed service level agreements (SLAs) to the application teams. This is the principle on which cloud services are founded as well;

Figure 2: Complexity of Modernization



During parallel operation in the migration phase, the number of interfaces heightens the level of complexity significantly.

Source: Detecon

> Service-oriented architecture (SOA): The IT landscape is built up from a portfolio of reusable blocks of functions that can be developed and maintained independently of one another, assuring a high level of flexibility along with efficiency during the implementation of new functions as a combination of existing services.

IT at two speeds

Unfortunately, transforming a complex IT landscape with high technical debt into an SOA landscape is anything but a simple matter. A different form of separation and transformation could be more effective here:

> The installation of new components such as CRM/billing based on the latest technology that support critical business innovations;

> Stabilization of the current IT landscape and long-term dismantling of the functionality;

> Definition of a minimal interface between the two areas.

This creates two worlds: the "fast IT" that can satisfy the innovation demands of product management for rates, bundles, and special campaigns, and the "slow IT" that provides the basic functions (see Figure 3).

At first glance, this strategy appears to be a paradox. We have increased the number of systems and consequently created greater complexity. However, the architecture forces a clear separation between the new areas without technical debt and the legacy areas with high debt. Investments in the legacy areas are minimized. In actual fact, the technical debt is not repaid; investments are made instead in a new solution. The bottom line is that this architecture of two speeds is faster and costs less than a long-term refactoring or a high-risk modernization.

The example of the relationships between (M)VNO and (M)VNE provides the blueprint for this strategy.

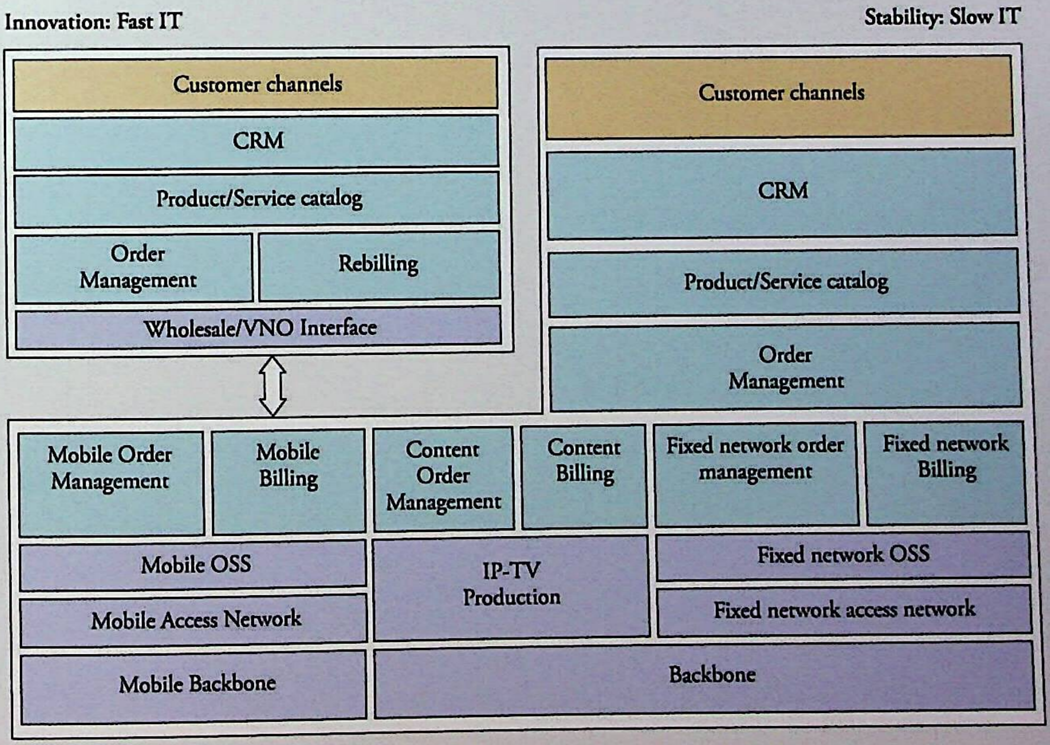
> A (mobile) virtual network operator does not operate its own network, but plays the role of a retailer for communications services. It buys from the wholesale dealer, the network operator, and sells to the end customers. It can offer its own price models and bundled offers as added value. While this model has proved to be especially effective in mobile services, it can be transferred to all product sectors.

> The (mobile) virtual network enabler is responsible for the production of the service and bills the VNO for the agreed wholesale allotment.

VNOs frequently have a more modern IT landscape than their wholesale suppliers and can take advantage of it to offer innovative products and excellent customer support. Shouldn't this model also be possible within a traditional telecommunications company?

The chart above shows a possible architecture. The "fast IT" focuses on a modern, catalog-driven, and highly integrated approach with CRM and billing. The "slow IT" stabilizes the platform with wholesale interface and OSS. The classic CRM and billing systems are successively dismantled as customers are migrated to the new VNO platform.

Figure 3: Architecture of the Two Speeds


Innovation: Fast IT
Stability: Slow IT
Customer channels
CRM
Product/Service catalog
Order Management
Rebilling
Wholesale/VNO Interface
Customer channels
CRM
Product/Service catalog
Order Management
Mobile Order Management
Mobile Billing
Content Order Management
Content Billing
Fixed network order management
Fixed network Billing
Mobile OSS
IP-TV Production
Fixed network OSS
Mobile Access Network
Fixed network access network
Mobile Backbone
Backbone

Source: Detecon

The important point is a clear boundary between the two worlds with a stable interface as the connection that can be structured analogously to familiar wholesale/(M)VNO interfaces.

Silos and other pitfalls

The strategy of two speeds does something that is in contradiction to the classic strategy of simplification and consolidation: it creates a redundant silo. This is normally avoided. This strategy can be successful only if there is compliance with strict governance featuring clear rules:

> The "fast IT" must be kept lean and technical debt must be avoided;
> The "slow IT" must be simplified and its output reduced.

This also has an impact on the organization of the IT: A sensible idea is to divide the structure in such a way that both parts can be operated independently of each other and with the focus specifically required for each – innovation and stability. Interfaces and SLAs regulate the collaboration. Competition for budgetary resources must be avoided. The common objective of achieving powerful, innovative IT must be the guiding vision.

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1
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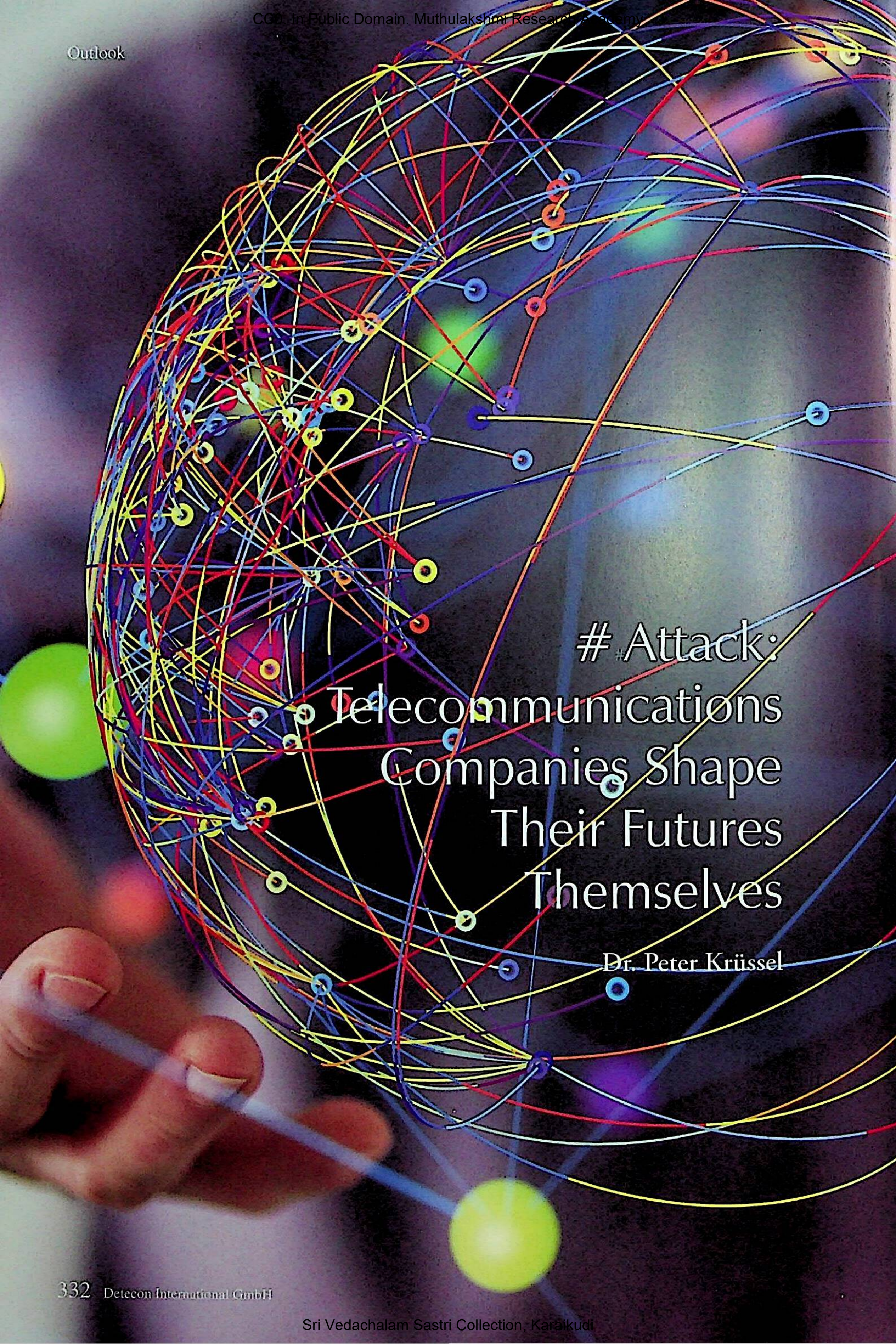

Attack: Telecommunications Companies Shape Their Futures Themselves

Dr. Peter Krüssel

Telecommunications companies control their own destiny. In the ideal case, they will compete against one another as well as against globally active web players, most of them American, like Apple, Google, Facebook, and Amazon. They will compete with offerings along the entire length of the added-value chain, including connectivity. The field of competition is defined as well by numerous OTT providers who specialize in certain services and target groups. The key message in this context, however, can be stated in this way: The telcos themselves must force the so-called "**heterogeneous power play**"!

By going on the attack, they can avoid a scenario in which they play a role as a so-called bit pipe provider or a wholesale-only provider without any direct contact to consumers. A scenario of this nature would be neither desirable from the standpoint of the telecommunications companies nor worthy of pursuit from the customer or industrial policy perspective.

That is why telcos must accept the challenges presented by digitalization and initiate the necessary steps for their transformation. These measures concern equally the internal aspects in the sense of adaptation of production methods, structures, and processes as well as the external actions in the direction of products and customers. All three volumes of Future Telco have pointed out the significance of the so-called **seven levers** that guide the options for the actions of the telcos so that they will be able to carry the "heterogeneous power play" to a successful close for themselves.

The network is, and will remain, the key point of attack. What is needed is an **integrated network of full-area coverage** that can fulfill the high and many-sided demands of a digitalized economy and society for a "serious web", capacity, coverage (outdoor and indoor), latency times, and various other quality parameters. Companies that have both network domains at their disposal and can merge them skillfully in production and in the products and services for their customers will have a clear competitive advantage over carriers who have only one network domain and over OTTs who, in the future, will as a minimum offer mobile connectivity. Mobile-only providers will disappear from the market, engulfed by consolidation, or they will fall into the role of the bit pipe, of the "cheapjack", and of the OTT enabler.

Along with integration of the networks, **new technologies such as SDN/NFV and the convergence of IT and NT** will offer opportunities for substantial gains in efficiency and agility of production. Automation, standardization, centralization, and flexibility are the attributes that describe this advance in production productivity, which has immense potential. The opportunities arising from these technologies are not limited to the national context; there will be benefits in the sense of genuine international scalability of the technologies because production can be centralized and optimized across all of the borders between operators and countries. We will see the rise of a production model for telecommunications companies that is similar to that of the OTTs.

The transformation will not stop with the network function, however. Other core functions in companies will also be affected. Another objective will be to apply the transformation to those functions that represent the customer interfaces: marketing, sales, and service. While the realization of efficiency gains will be important here as well, the change will go beyond this scope to encompass improvement in the customer experience. The OTTs set the benchmark because they are experts at serving the digital touch points of their customers. The focal point for the carriers will be an orchestrated interplay of all offline and online channels for all of the business transactions related to sales and service. Securing, cultivating, and expanding consumer relationships will be a key field of action for telecommunications companies if they want to decide the "heterogeneous power play" in their favor. The essential point will be **differentiation in developing the market**, the addressing of the needs of individual segments – right down to specific individuals. Personalized knowledge based on big data instruments, context-related, proactive address, and contact opportunities for customers will play an increasingly vital role in the future.

Success with customers will be decided by **attractive, innovative products and services specific to target groups** as well as by the structure of the customer interfaces. Special attention must be paid on the private customer market to the subgroup of households because this is where the central means of production in the hands of the integrated carriers – the integrated network – can be exploited as a USP (in the form of functionally integrated products) over OTTs and other carriers who have only one network domain. Innovative products and services for business customers must be pointed in the same direction; the telcos' assets mentioned here match the needs of this segment and can credibly be put to good use.

Many of these products will be the result of **partnerships** with corporate customers, industry specialists, or OTTs. The variety and complexity of the use cases and the demands made on their solutions in a completely digitalized world are too great for any one telecommunications company or OTT to master on its own. The prerequisite is a controlled opening of the NT and IT infrastructures of the telcos or IT platforms with open application program interfaces (APIs) where partners, app developers, OTTs, and corporate customers can dock and develop special solutions.

The significance of **wholesale and wholebuy** functions will surge against the backdrop of the demand for global reach of assured quality, especially of the business customers. Cooperative ventures among network operators will be indispensable so that seamless national network coverage and international coverage can be guaranteed even in the most remote regions of the world.

The six points of action that have been described are of fundamental, transformational significance for telecommunications companies. But they will lead to success only if the seventh lever is also applied: the creation of **internal agility.** This will be assured by radical change in traditional structures, cultures, processes, and IT as the system's technical image of the living processes.

The political establishment and **regulatory authorities** must provide a framework that enables all of the market players to compete with one another at peer level if this comprehensive transformation process is to be successful. Its impact will not be limited to telecommunications companies, but will extend to the entire economy. The instruments can be provided by sector-specific regulation that, for instance, includes substituting OTT services. It will also be necessary to determine the extent to which generally applicable regulations for data and consumer protection are adopted and enforced. Moreover, the application of competition and anti-trust laws will provide starting points for the regulation of platform-based services and players. In view of the dynamics of market events and the network effects or the logic of Internet-based business models – "The winner takes it all" – reaching an adequate velocity in the adaptation and application of the regulatory framework will be decisive.

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About Detecon International GmbH

Detecon is one of the world's leading consulting companies for ICT management consulting. Our services focus on consulting and implementation solutions which are derived from the use of information and communications technology (ICT). They encompass classic strategy and organization consulting as well as the planning and implementation of complex, technological ICT architectures and applications. Detecon's expertise bundles the knowledge from the successful conclusion of management and ICT consulting projects in more than 160 countries. Detecon is a subsidiary of T-Systems International, the business customer brand of Deutsche Telekom.

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Knowledge@Detecon

The telecommunications industry is still facing disruptive changes. Intense cutthroat competition and the challenges of digitalization are forcing telecommunications companies to act. The Future Telco trilogy describes the radius of action along the added-value chain as shaped by seven levers. The latest volume entitled "Future Telco III: Power Play for Telecommunications Companies" demonstrates that the large OTT ecosystem providers were victors only in the first round. Telcos still have a chance to turn the game around to their favor during the second round.

#Power Play: The "Heterogeneous Power Play" must be pushed by telecommunications providers, however. The required transformation steps concern equally the internal aspects in the sense of adaptation of production methods, structures, and processes as well as the external actions in the direction of products and customers. In other words – telcos control their own destiny!

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